

Acute Coronary Syndrome

Pea Ridge Fire Department
EMS Refresher Program

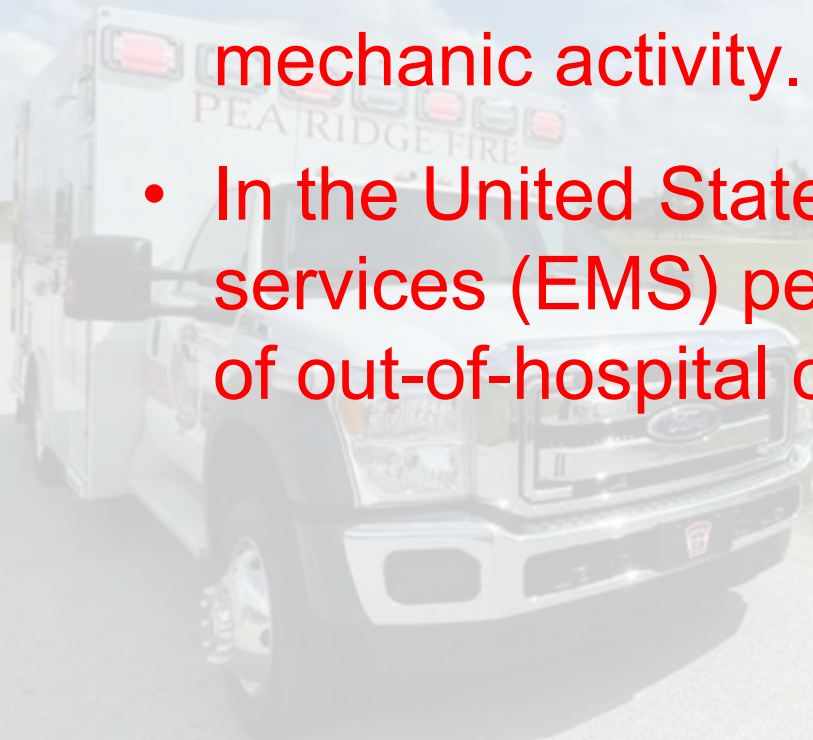


Introduction

- The role of the paramedic was created to provide early treatment for patients with acute myocardial infarction (AMI).
- AMI occurs when sudden narrowing or complete occlusion of a coronary artery causes myocardial tissue necrosis
- One person has an AMI in the United States about every 40 seconds.

Introduction

- Cardiac arrest is the cessation of cardiac mechanic activity.
- In the United States, emergency medical services (EMS) personnel treat about 60% of out-of-hospital cardiac arrests each year.



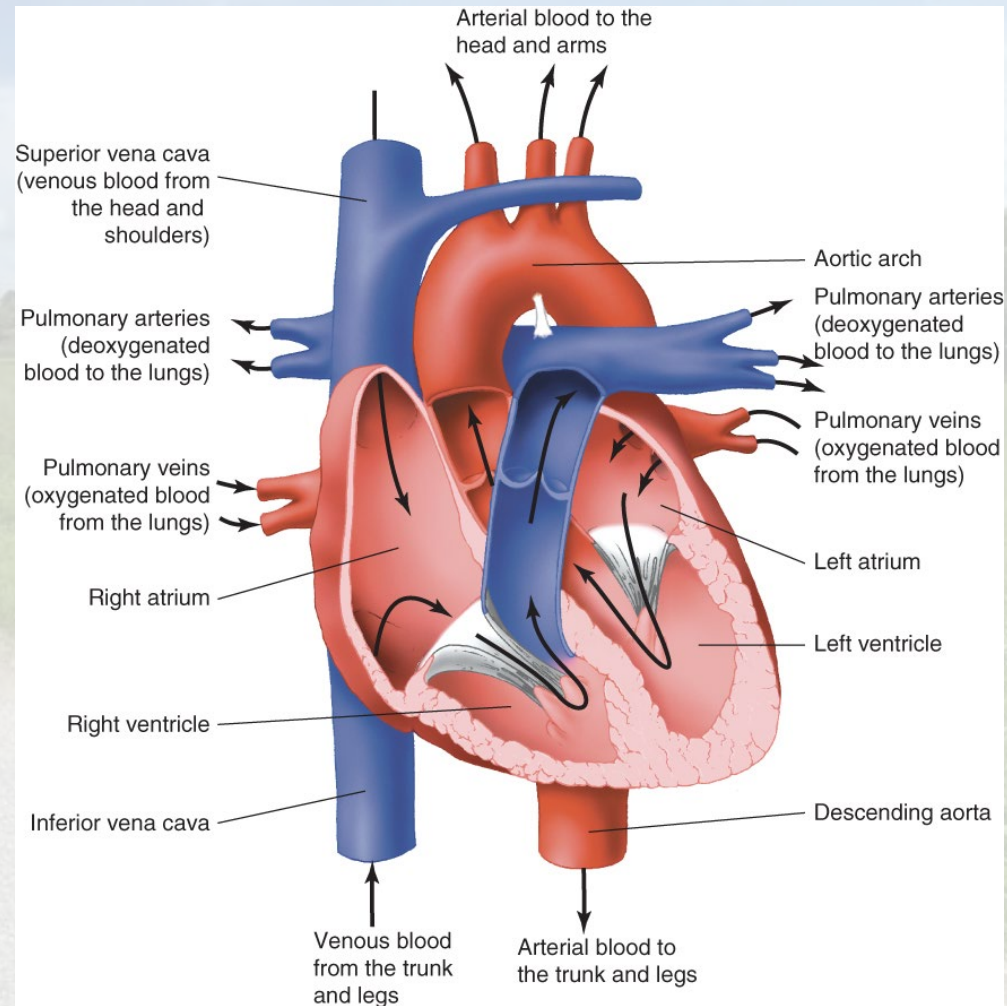
Anatomy and Physiology Review

- Structure and function
 - Cardiovascular system
 - Composed of heart and blood vessels
 - Delivers oxygenated blood and nutrients to cells
 - Delivers chemical messengers (hormones)
 - Transports waste products to disposal sites



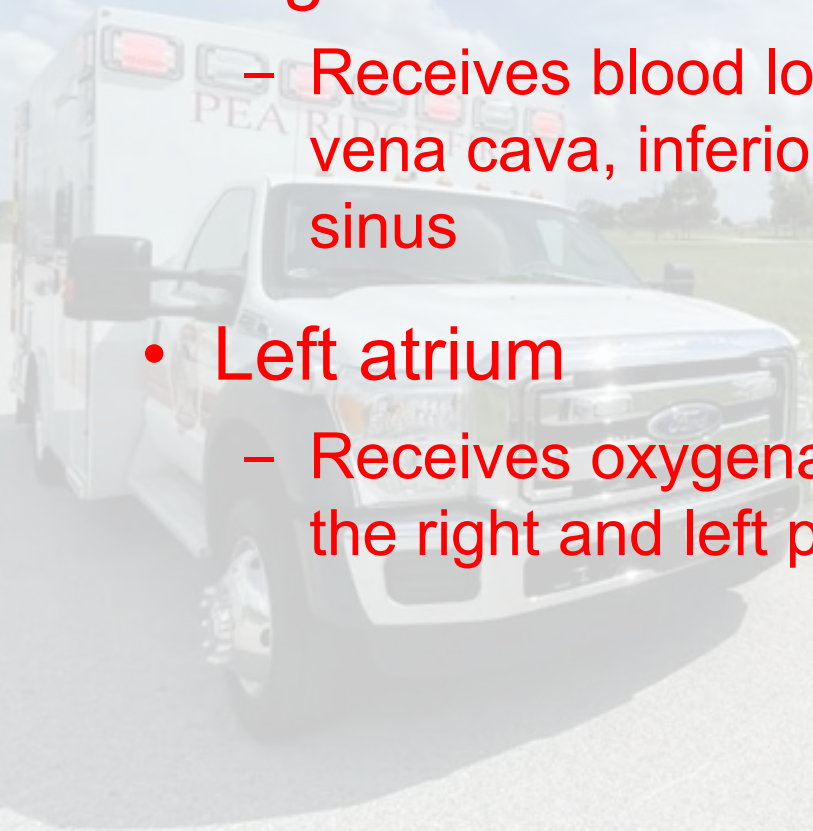
The Heart

- The heart has four chambers
 - Right atrium
 - Left atrium
 - Right ventricle
 - Left ventricle



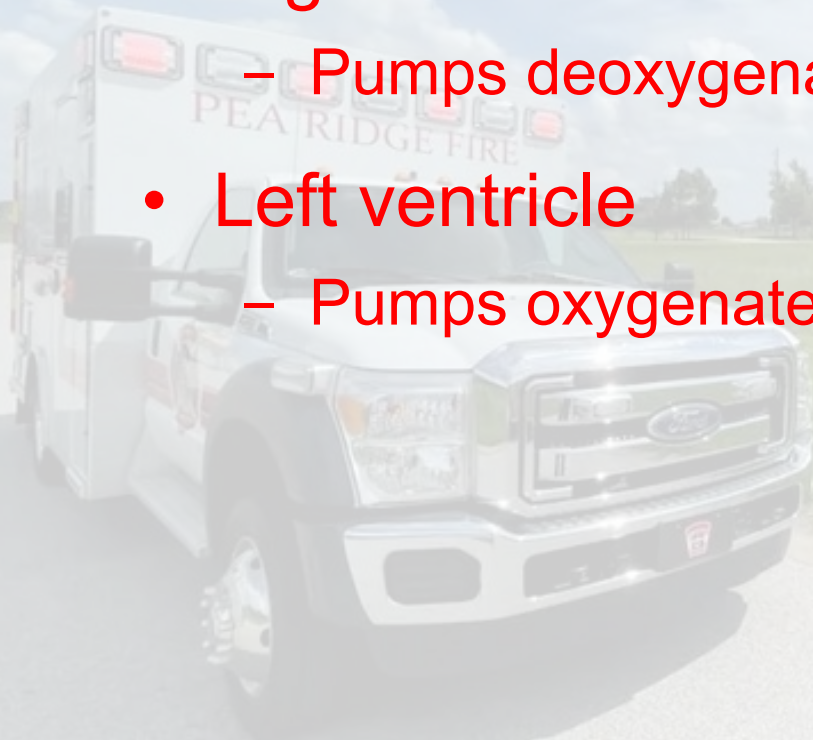
The Heart

- Right atrium
 - Receives blood low in oxygen from the superior vena cava, inferior vena cava, and the coronary sinus
- Left atrium
 - Receives oxygenated blood from the lungs via the right and left pulmonary veins



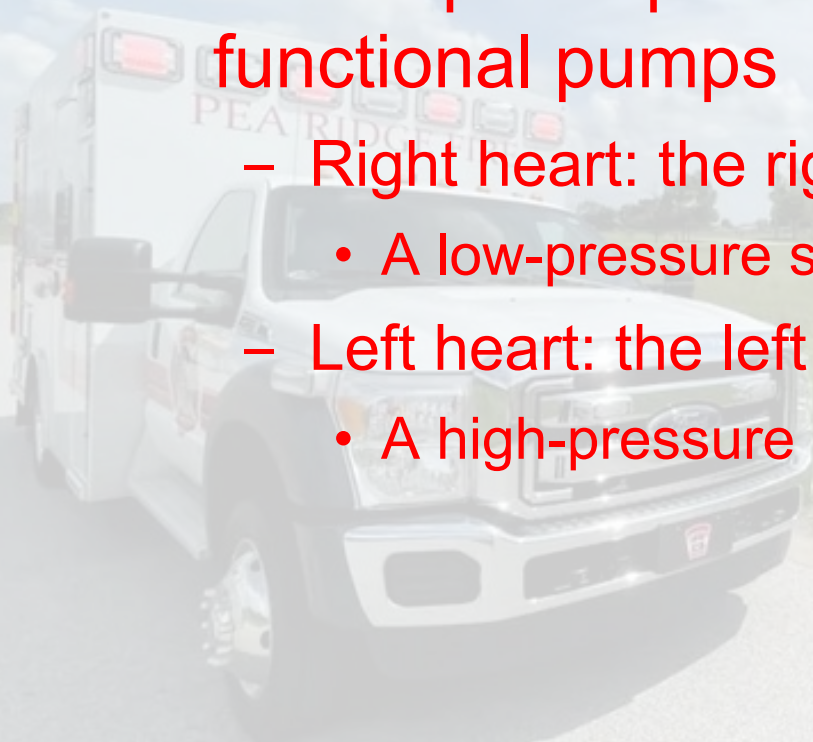
The Heart

- Right ventricle
 - Pumps deoxygenated blood to the lungs
- Left ventricle
 - Pumps oxygenated blood throughout the body



The Heart

- The septa separate the heart into two functional pumps
 - Right heart: the right atrium and right ventricle
 - A low-pressure system (pulmonary circulation)
 - Left heart: the left atrium and left ventricle
 - A high-pressure system (systemic circulation)



The Heart

- The myocardium is the middle layer of the heart wall.
 - Composed of thick muscle tissue
 - Responsible for:
 - Cardiac contraction
 - Efficient ejection of blood from the heart



The Heart

- Coronary arteries

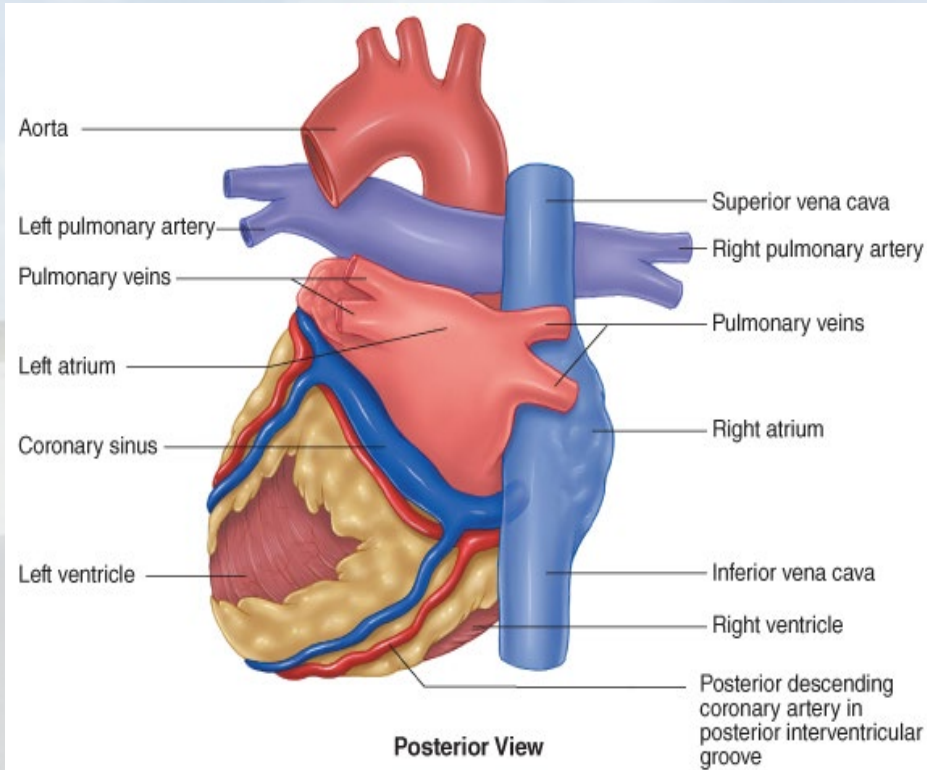
- The left main coronary artery supplies:

- Left ventricle
 - Interventricular septum

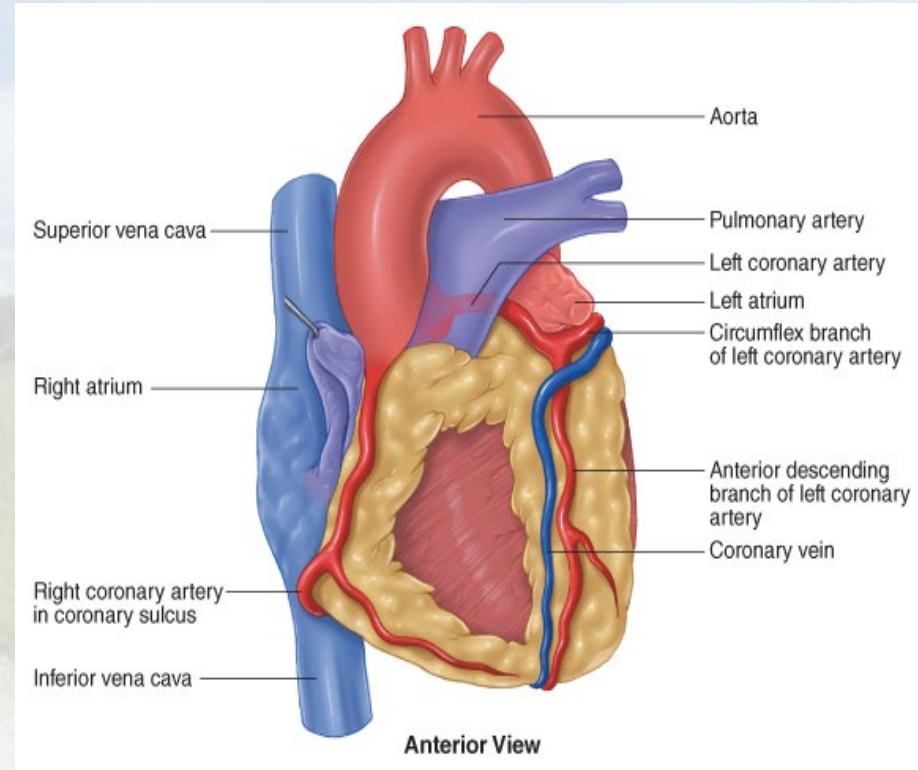
- The right coronary artery (RCA) supplies:

- Right atrium
 - Right ventricle
 - Part of the left ventricle
 - Portions of the conduction system

The Heart



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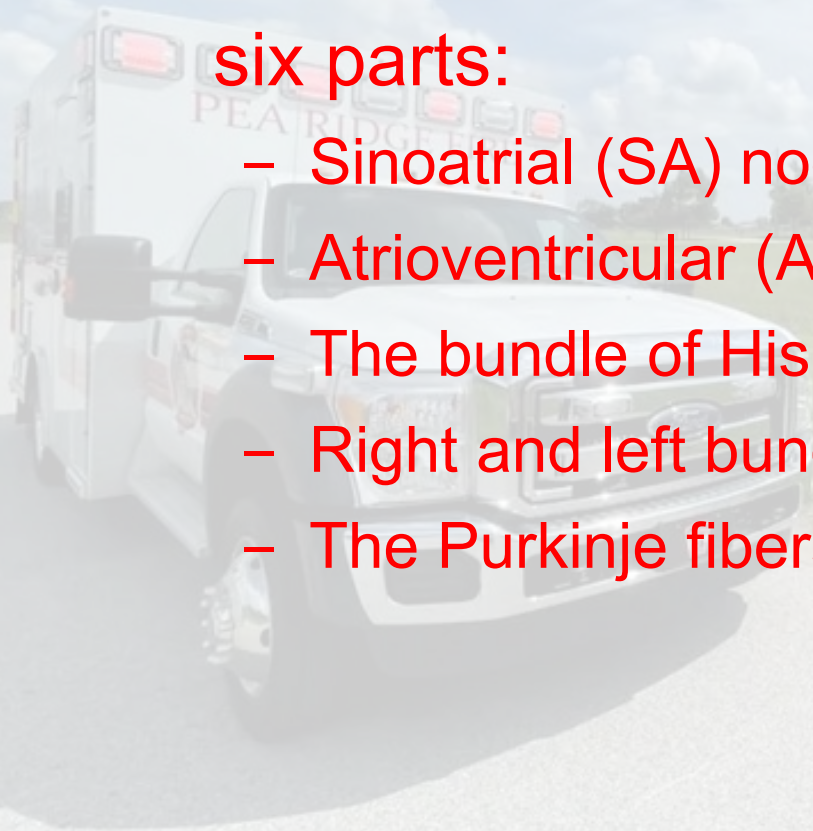
The Heart

- Cardiac cells have four properties that help the heart function:
 - Automaticity
 - Excitability
 - Conductivity
 - Contractility



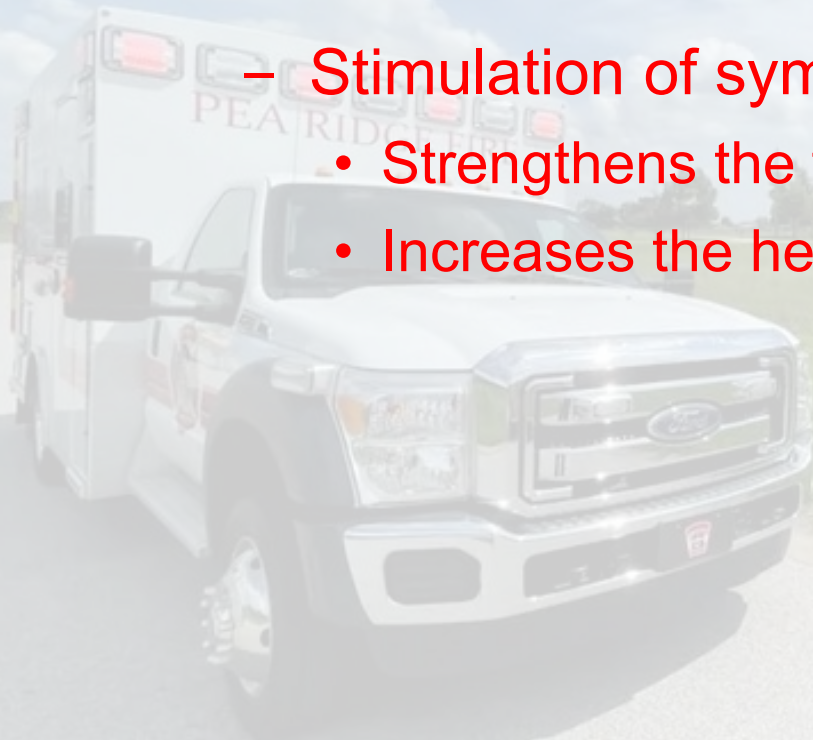
The Heart

- The cardiac conduction system comprises six parts:
 - Sinoatrial (SA) node
 - Atrioventricular (AV) node
 - The bundle of His
 - Right and left bundle branches
 - The Purkinje fibers



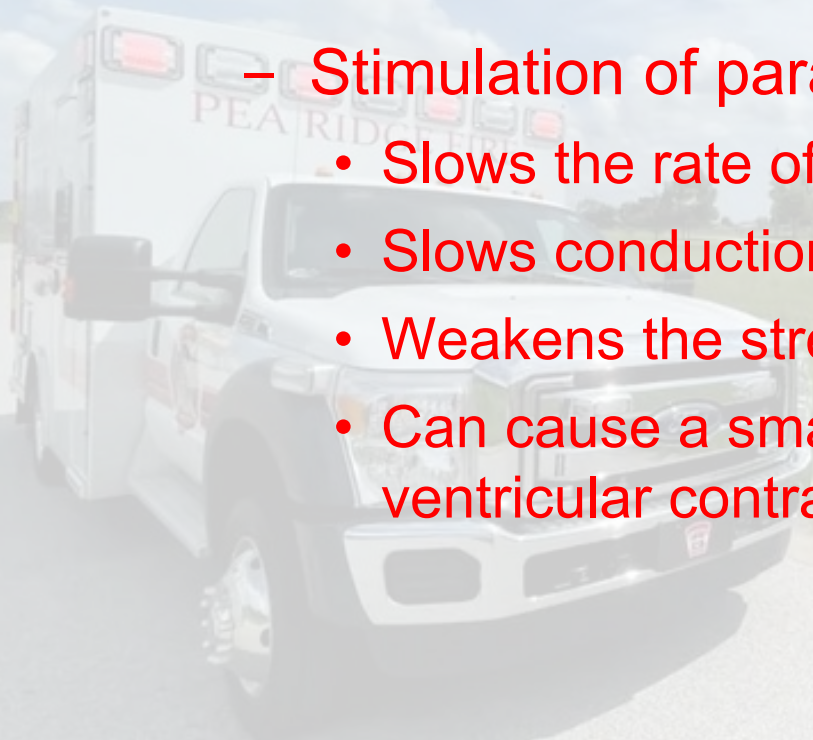
The Heart

- Nerve stimulation
 - Stimulation of sympathetic nerves
 - Strengthens the force of contraction
 - Increases the heart rate



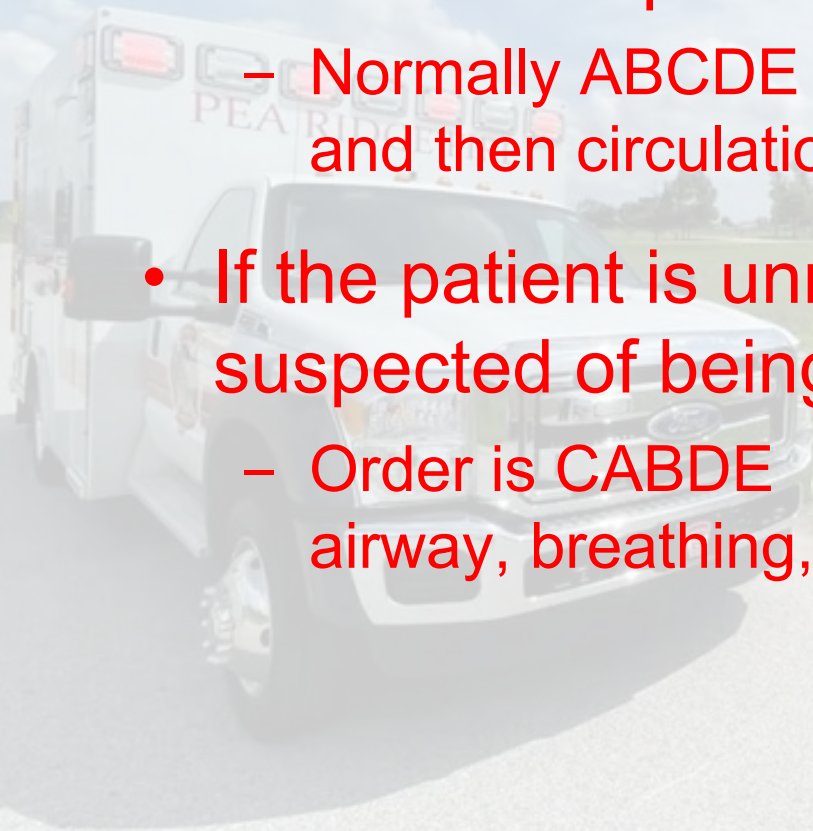
The Heart

- Nerve stimulation (cont'd)
 - Stimulation of parasympathetic nerves
 - Slows the rate of discharge of the SA node
 - Slows conduction through the AV node
 - Weakens the strength of atrial contraction
 - Can cause a small reduction in the force of ventricular contraction



Primary Survey

- The order of primary survey steps varies.
 - Normally ABCDE (assess airway, breathing, and then circulation, disability, and exposure)
- If the patient is unresponsive and is suspected of being in cardiac arrest:
 - Order is CABDE (assess circulation, then airway, breathing, disability, and exposure)



History Taking

- Acute coronary syndromes (ACSs): a series of cardiac conditions caused by an abrupt reduction in blood flow through a coronary artery
 - Unstable angina
 - Non–ST segment elevation myocardial infarction (NSTEMI)
 - ST segment elevation myocardial infarction (STEMI)

History Taking

- Chest pain is often the presenting symptom of ACSs.
- Dyspnea is another chief complaint.
- If your patient has fainted, try to determine whether he or she fainted from cardiac or noncardiac causes.
 - Cardiac: dysrhythmias, increased vagal tone, and heart lesions

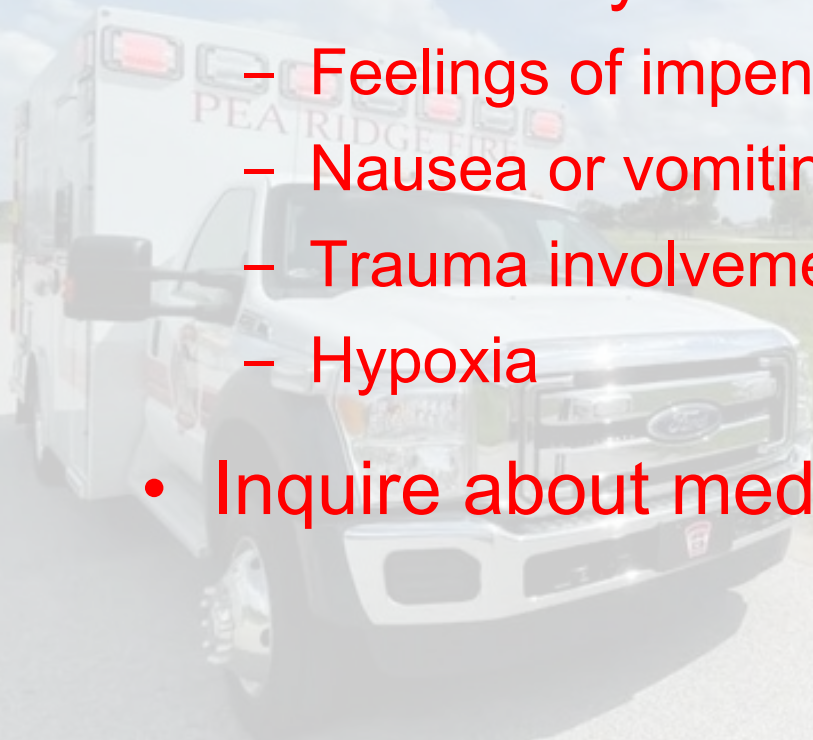
History Taking

- Palpitations: sensation of abnormally fast or irregular heartbeat
 - Often caused by dysrhythmia.
 - Inquire about:
 - Onset, frequency, and duration
 - Previous episodes



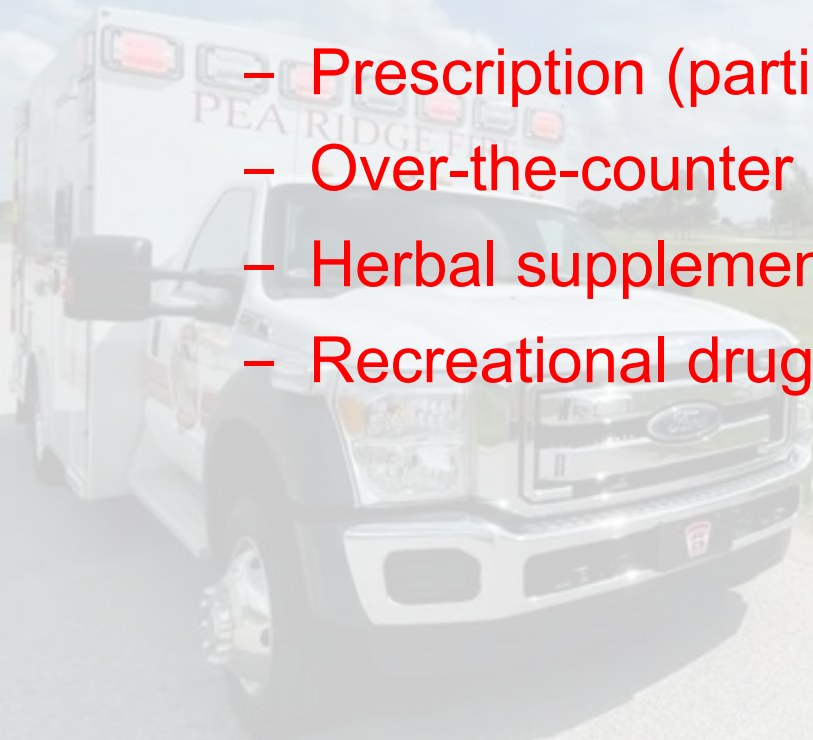
History Taking

- Patients may also report:
 - Feelings of impending doom
 - Nausea or vomiting
 - Trauma involvement
 - Hypoxia
- Inquire about medical history.



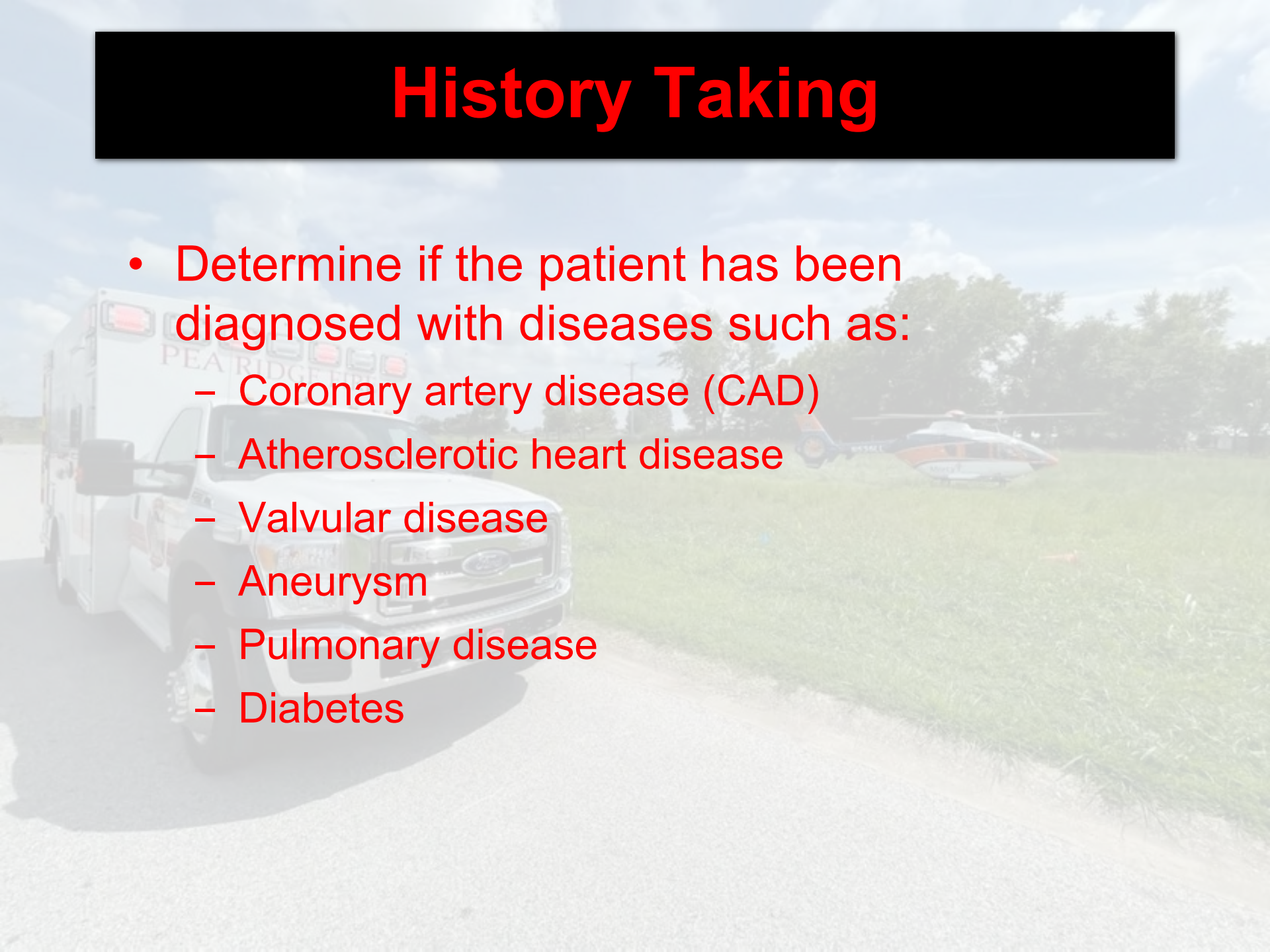
History Taking

- Ask about medications
 - Prescription (particularly cardiac)
 - Over-the-counter drugs
 - Herbal supplements
 - Recreational drugs



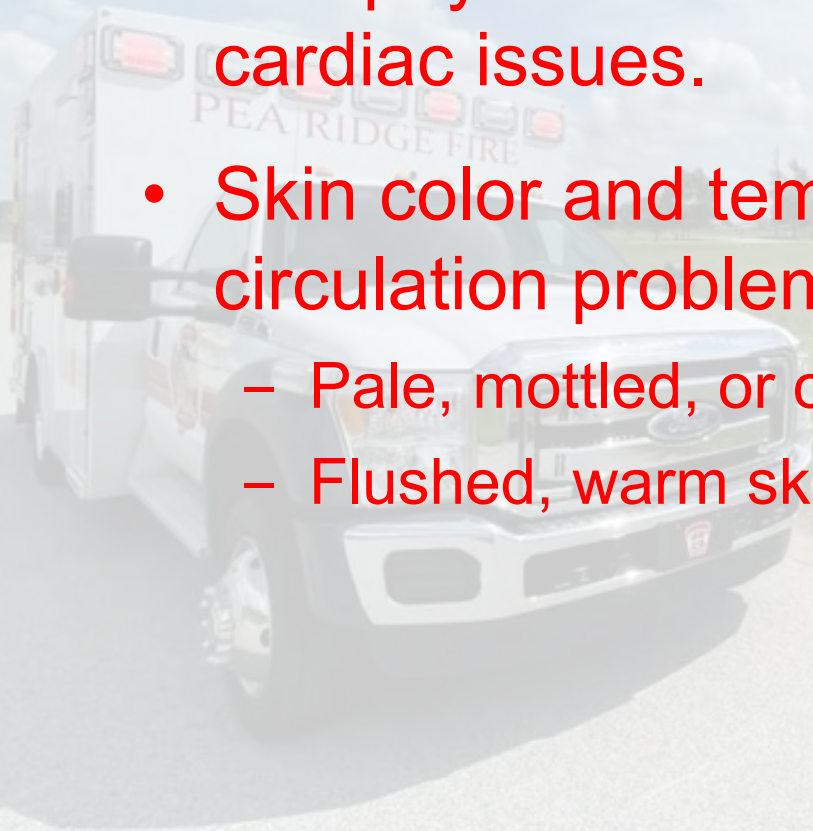
History Taking

- Determine if the patient has been diagnosed with diseases such as:
 - Coronary artery disease (CAD)
 - Atherosclerotic heart disease
 - Valvular disease
 - Aneurysm
 - Pulmonary disease
 - Diabetes



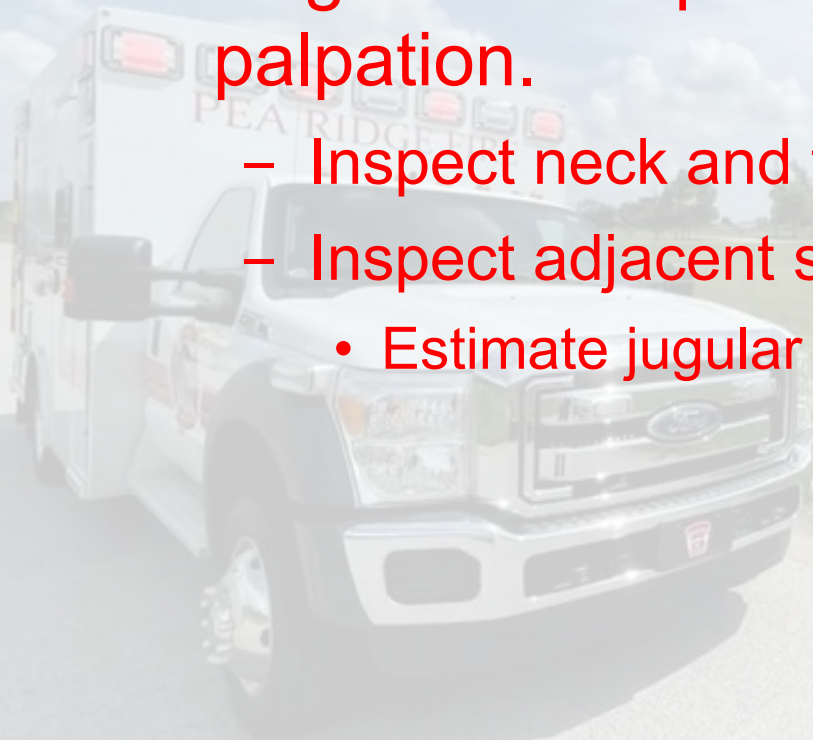
Secondary Assessment

- The physical exam should emphasize cardiac issues.
- Skin color and temperature may indicate circulation problems.
 - Pale, mottled, or cyanotic skin
 - Flushed, warm skin



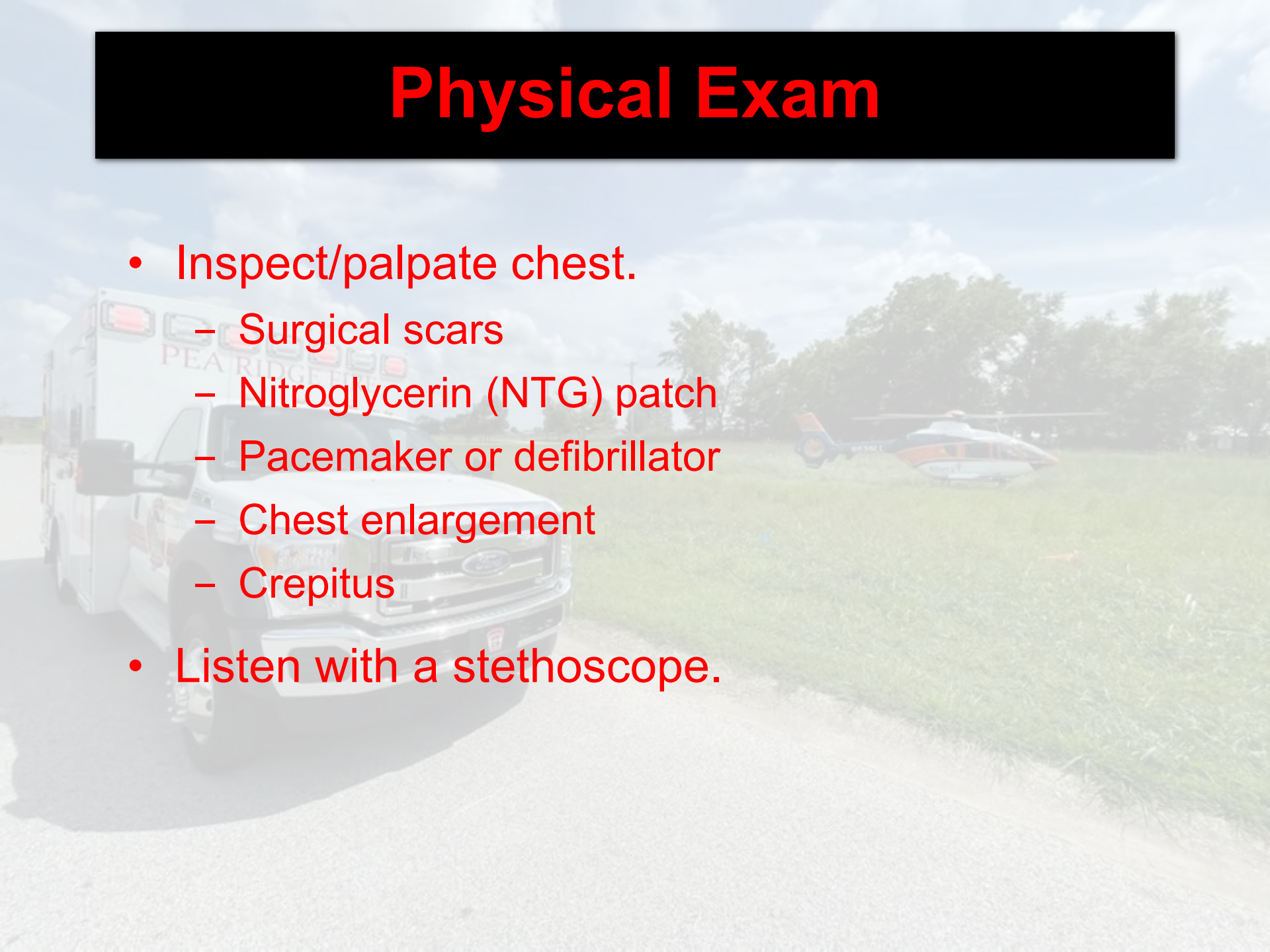
Physical Exam

- Begin with inspection, auscultation, and palpation.
 - Inspect neck and tracheal position.
 - Inspect adjacent structures (neck veins, etc.).
 - Estimate jugular venous pressure.



Physical Exam

- Inspect/palpate chest.
 - Surgical scars
 - Nitroglycerin (NTG) patch
 - Pacemaker or defibrillator
 - Chest enlargement
 - Crepitus
- Listen with a stethoscope.

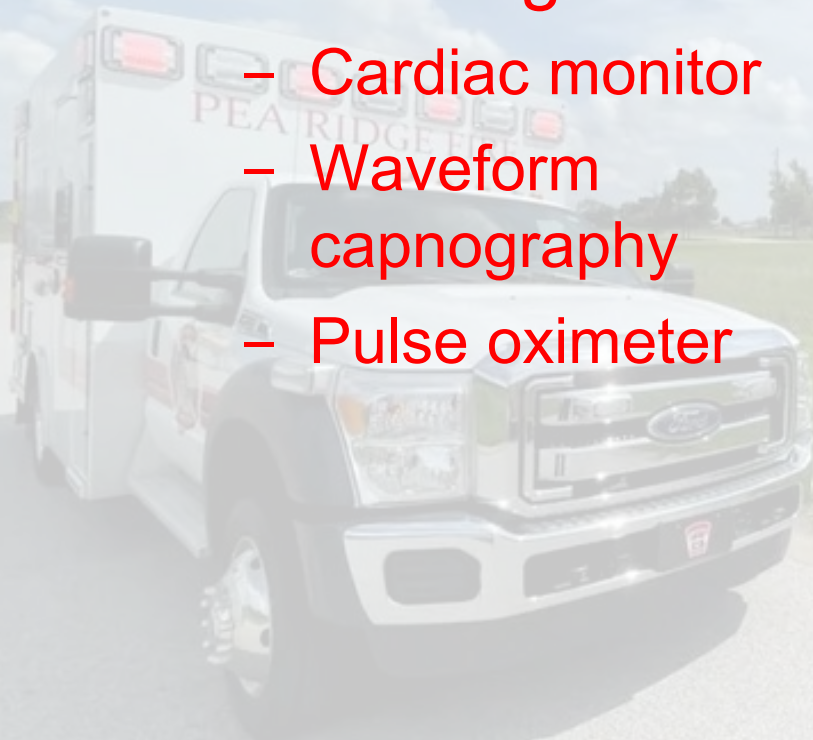


Physical Exam

- Palpate the patient's abdomen for distention and pulsations.
 - Pulsations in the epigastric area may be a sign of an abdominal aortic aneurysm.
- Check for swelling.
 - Bilateral pitting edema may be a sign of right ventricular failure (RVF).
 - One-sided pitting edema suggests blockage.

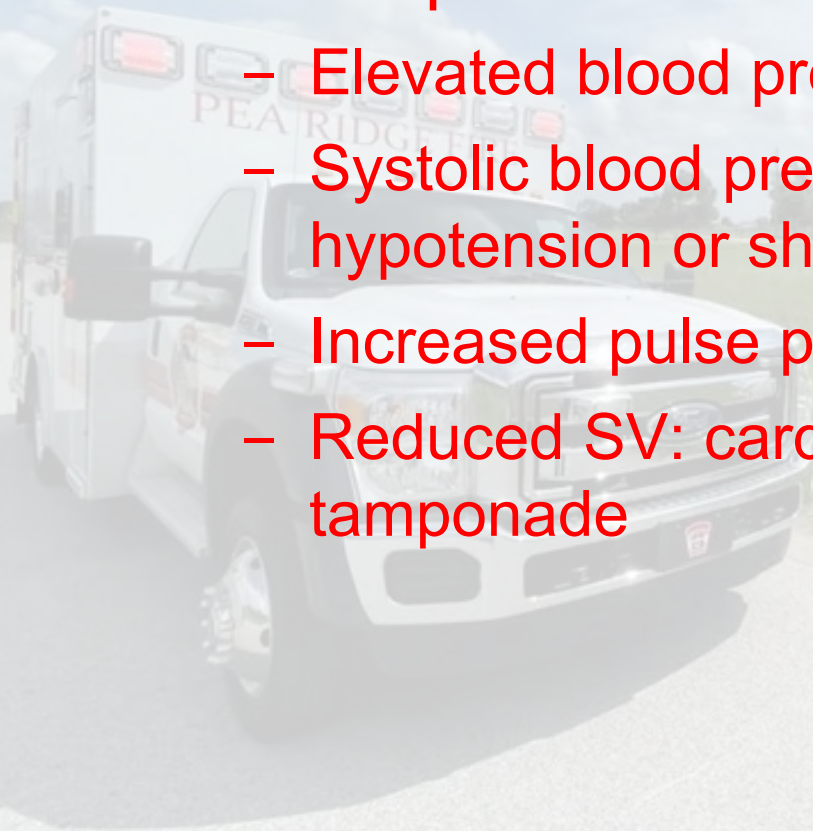
Physical Exam

- Monitoring devices
 - Cardiac monitor
 - Waveform capnography
 - Pulse oximeter
- Pulse findings
 - Pulse deficit
 - Pulsus paradoxus
 - Pulsus alternans



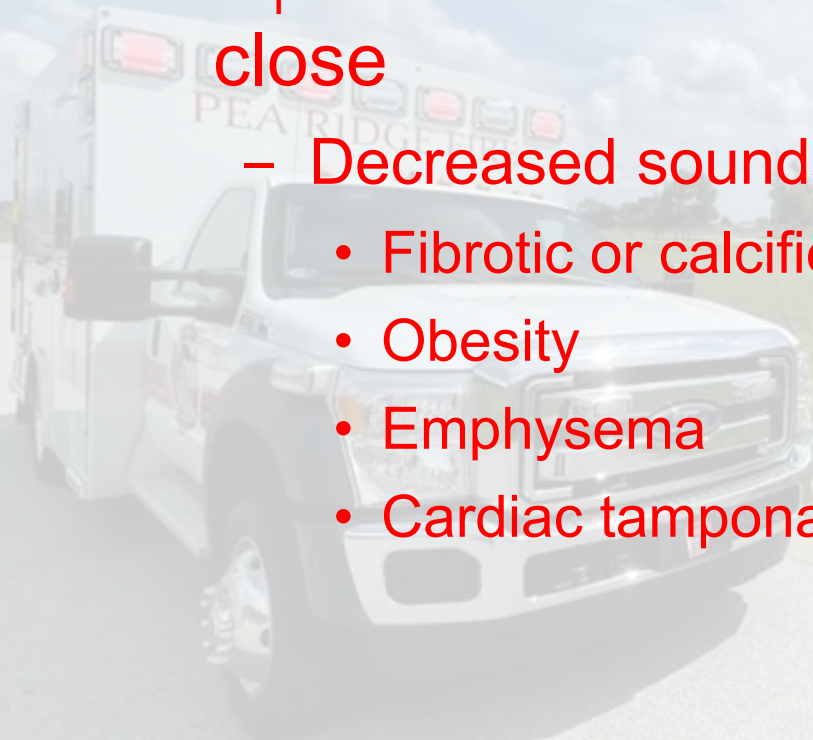
Physical Exam

- Blood pressure
 - Elevated blood pressure: anxiety or pain
 - Systolic blood pressure lower than 90 mm Hg: hypotension or shock
 - Increased pulse pressure: arteriosclerosis
 - Reduced SV: cardiogenic shock or cardiac tamponade



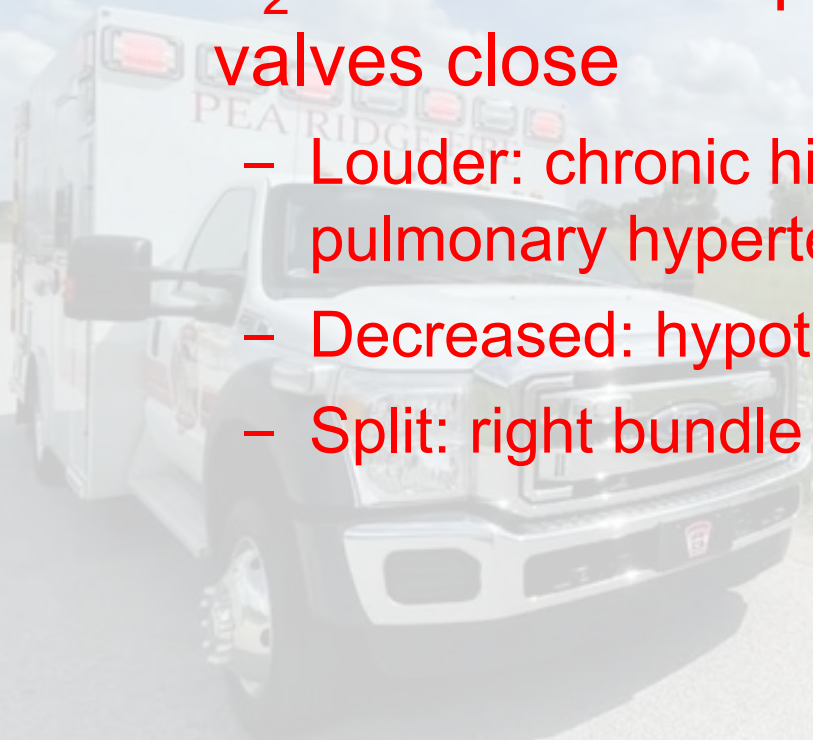
Physical Exam

- S_1 : occurs when tricuspid and mitral valves close
 - Decreased sounds can indicate:
 - Fibrotic or calcified mitral valve
 - Obesity
 - Emphysema
 - Cardiac tamponade



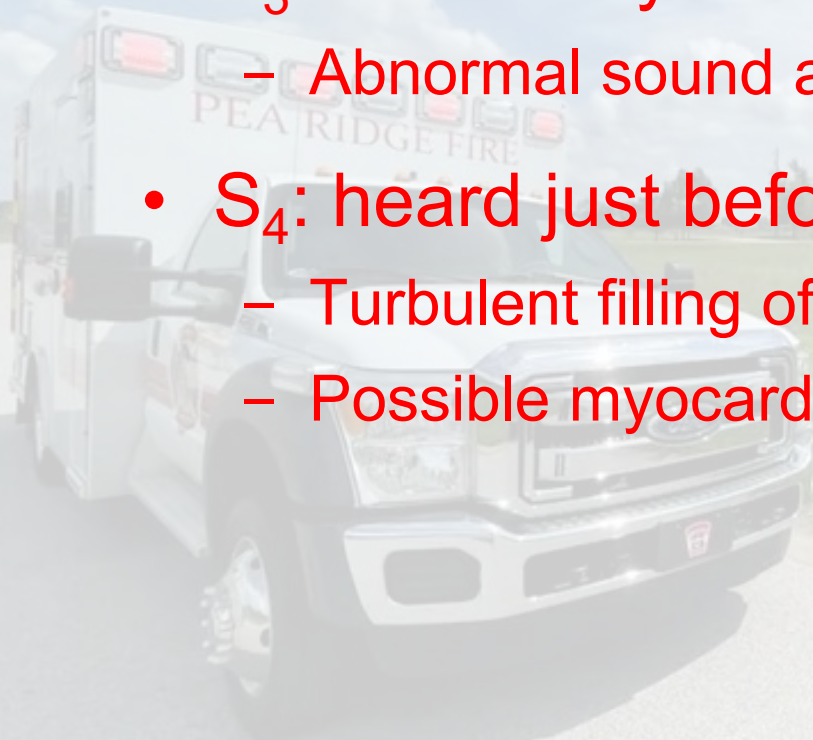
Physical Exam

- S_2 : occurs when pulmonary and aortic valves close
 - Louder: chronic high blood pressure or pulmonary hypertension
 - Decreased: hypotension
 - Split: right bundle branch



Physical Exam

- S_3 : caused by ventricular wall vibrations
 - Abnormal sound associated with heart failure
- S_4 : heard just before S_1
 - Turbulent filling of stiff ventricle in hypertrophy
 - Possible myocardial infarction



Physical Exam

- Heart murmur:
 - Ambiguous sound from turbulent blood flow through the valves
 - May indicate
 - Increased blood flow across a normal valve
 - Flow across an irregular or constricted valve
 - Blood flow into an enlarged heart chamber
 - Backwards blood flow through a compromised valve

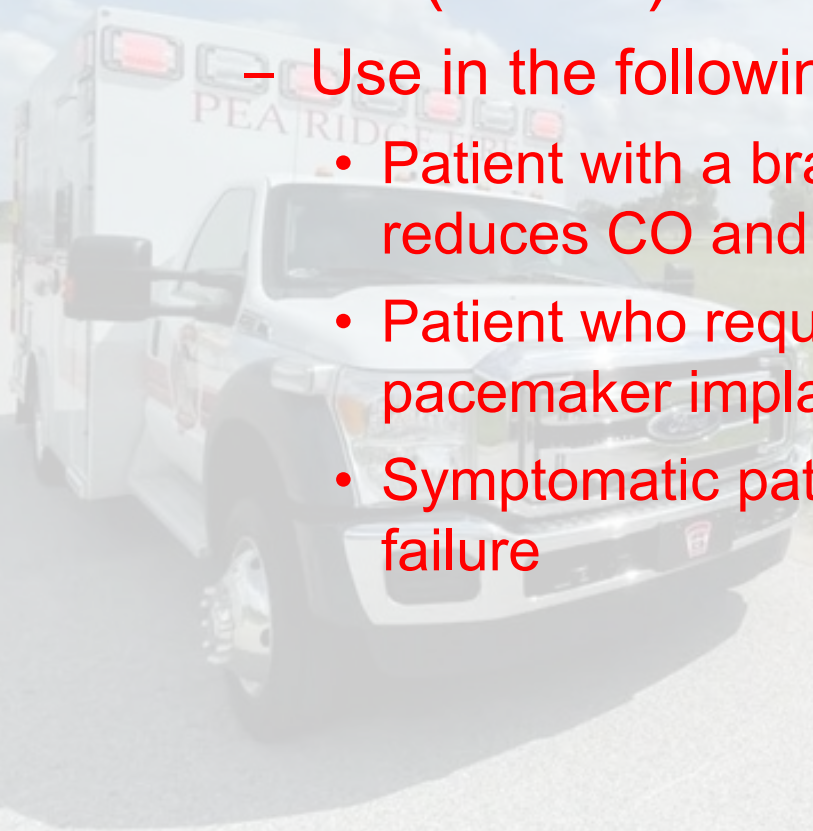
Reassessment

- Reassessment should be done on the way to the hospital.



Artificial Pacemakers

- TCPs (cont'd)
 - Use in the following situations
 - Patient with a bradydysrhythmia that severely reduces CO and does not respond to atropine
 - Patient who requires interhospital transfer for pacemaker implantation
 - Symptomatic patient with artificial pacemaker failure



12-Lead ECGs

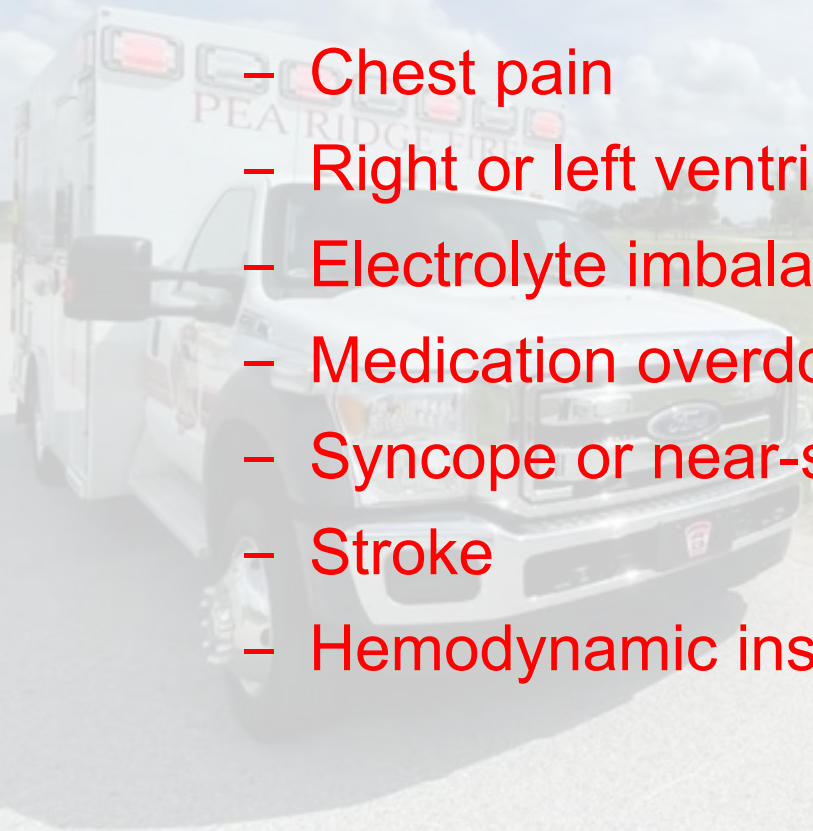
- Used to localize the cardiac muscle injury site and identify cardiac abnormalities.
- Each lead looks at the heart from a different angle.



12-Lead ECGs

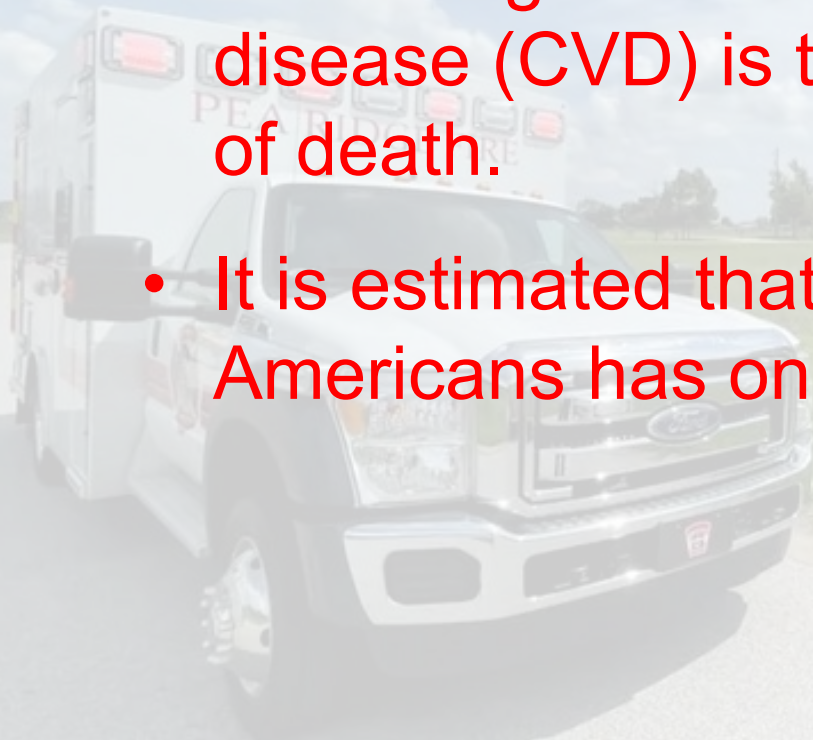
- Indications

- Chest pain
- Right or left ventricular heart failure
- Electrolyte imbalance
- Medication overdose
- Syncope or near-syncope
- Stroke
- Hemodynamic instability



Epidemiology of Cardiovascular Disease

- According to the AHA, cardiovascular disease (CVD) is the leading global cause of death.
- It is estimated that more than one in three Americans has one or more types of CVD.



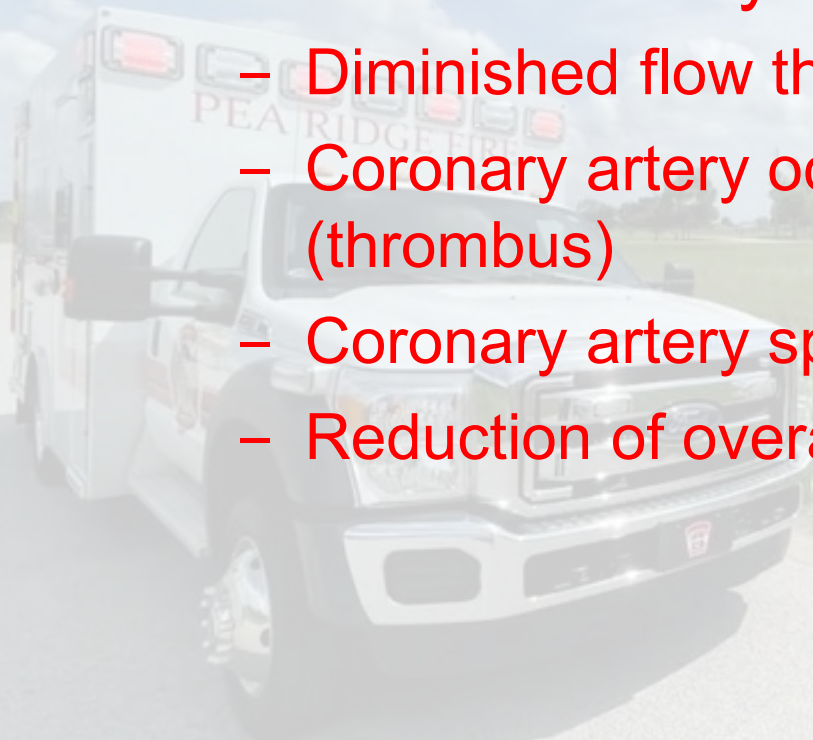
Epidemiology of Cardiovascular Disease

- Disease of coronary arteries and associated signs, symptoms, and complications
 - Such as angina pectoris and AMI
 - Characterized by atherosclerotic narrowing and blockage of arteries



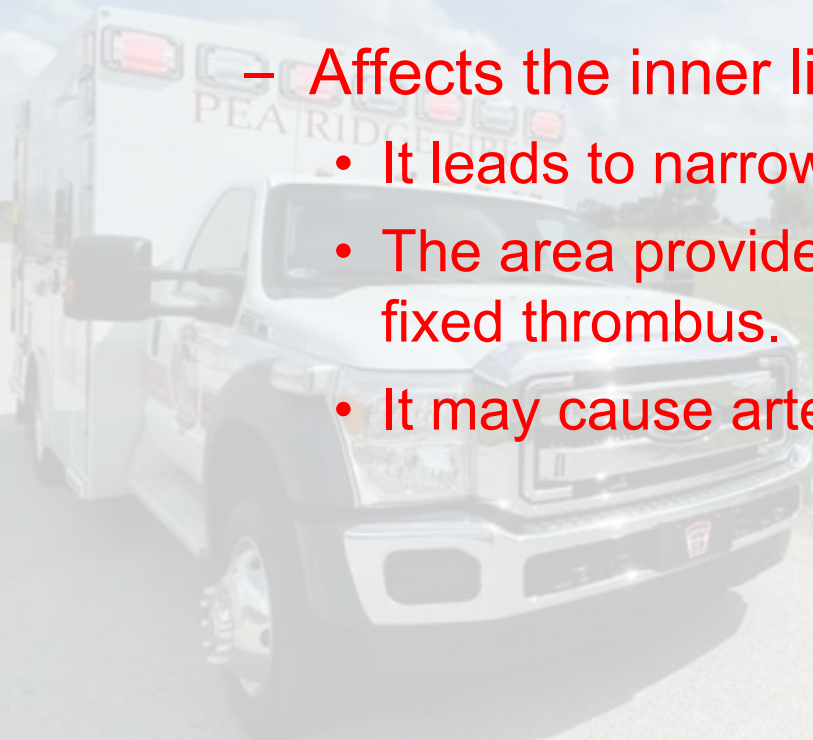
Acute Coronary Syndromes

- Characterized by:
 - Diminished flow through the coronary arteries
 - Coronary artery occlusion by a blood clot (thrombus)
 - Coronary artery spasm
 - Reduction of overall blood flow from any cause



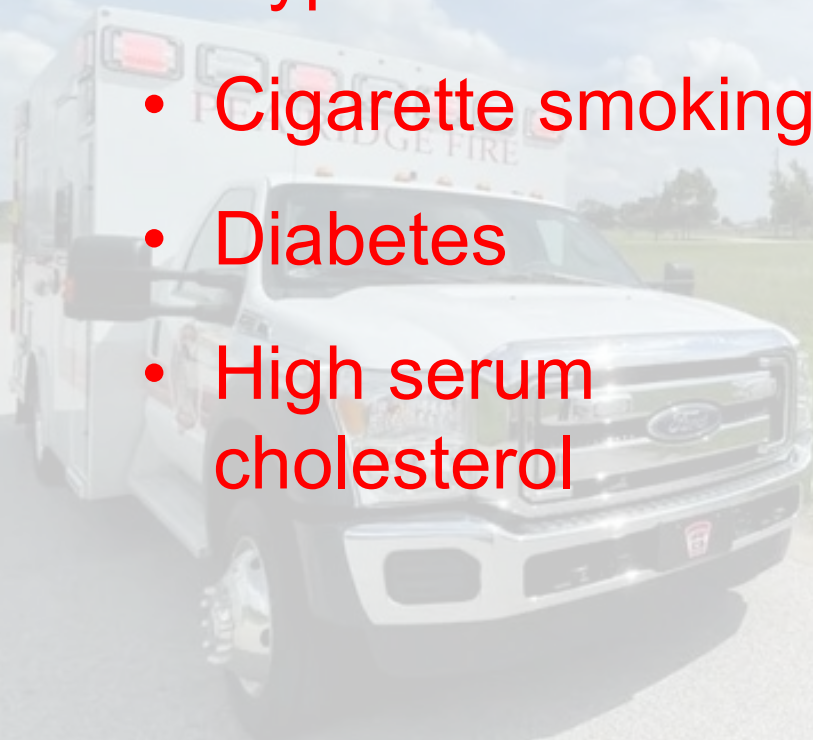
Acute Coronary Syndromes

- Atherosclerosis
 - Affects the inner lining of blood vessels
 - It leads to narrowing and blood flow reduction.
 - The area provides a locus for the formation of a fixed thrombus.
 - It may cause arteriosclerosis.



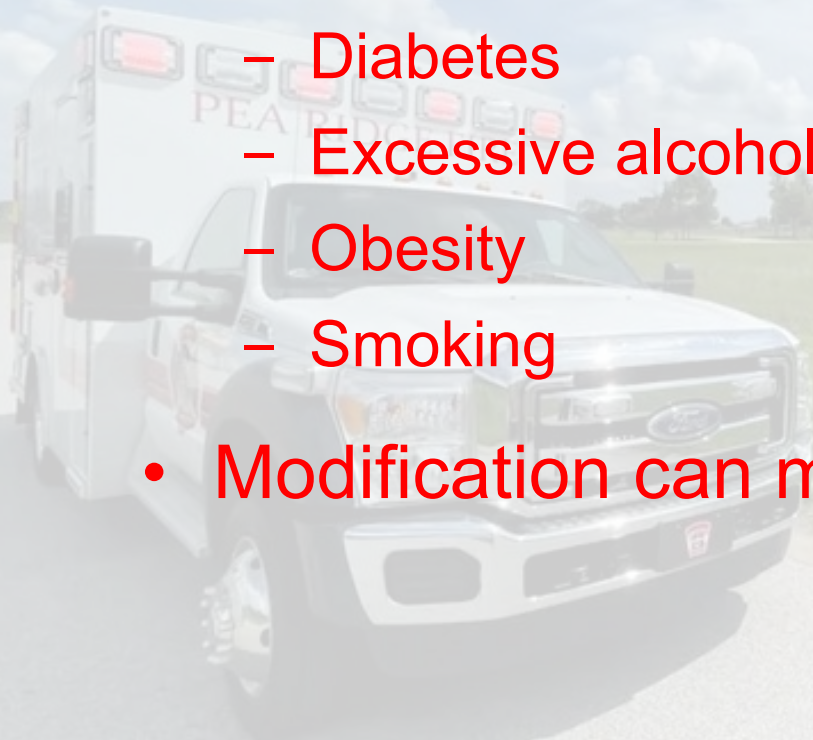
Risk Factors for CHD

- Hypertension
- Cigarette smoking
- Diabetes
- High serum cholesterol
- Lack of exercise
- Obesity
- Family history
- Male gender



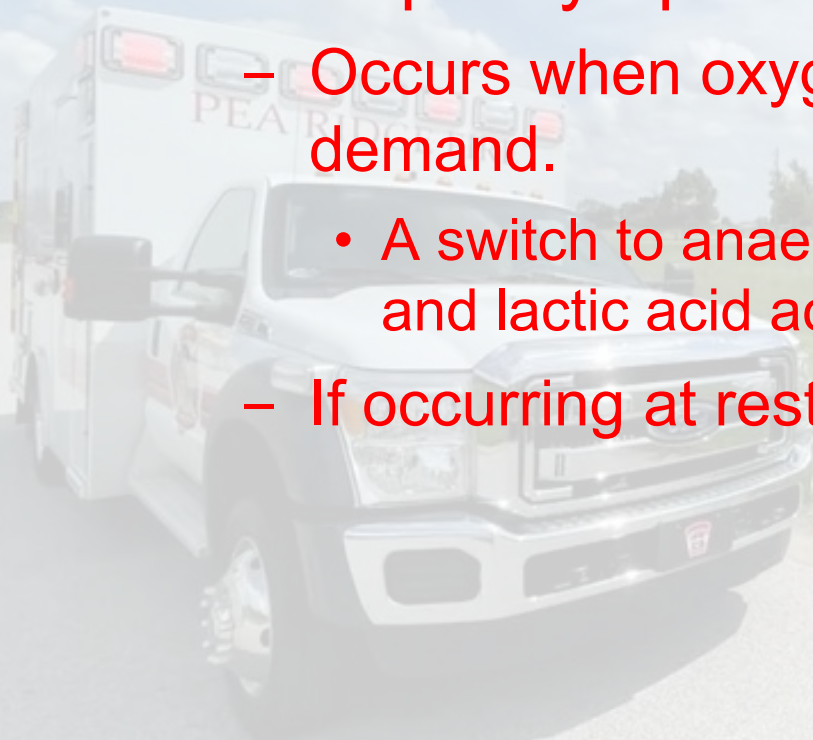
Risk Factors for CHD

- Modifiable risk factors include:
 - Diabetes
 - Excessive alcohol use
 - Obesity
 - Smoking
- Modification can make a difference.



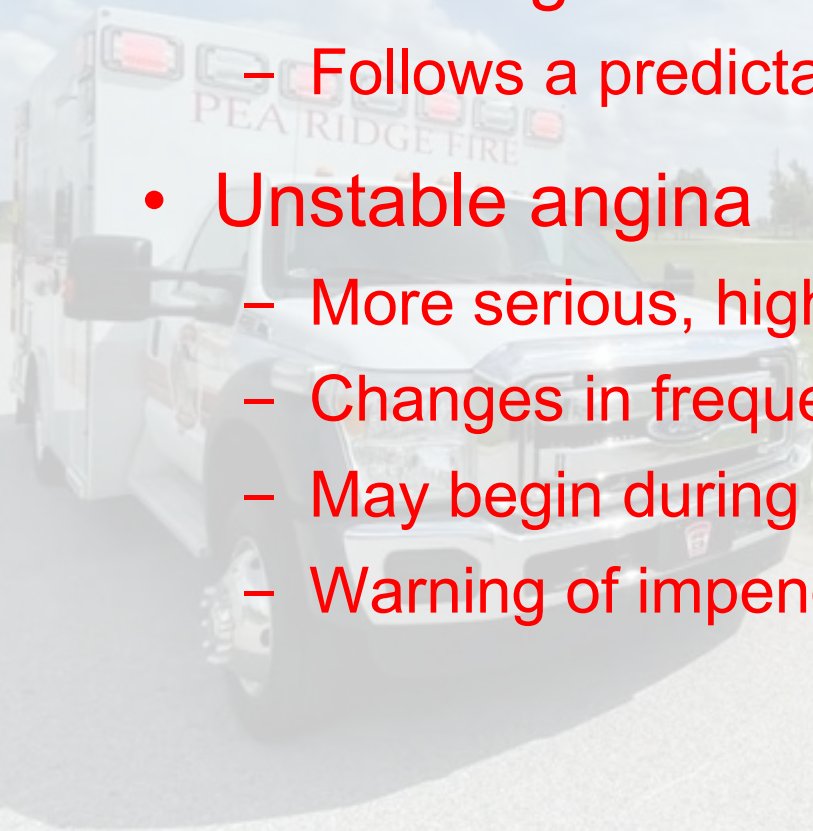
Angina Pectoris

- Principal symptom of CAD
 - Occurs when oxygen supply cannot meet demand.
 - A switch to anaerobic metabolism leads to CO_2 and lactic acid accumulation.
 - If occurring at rest, CAD is more severe.



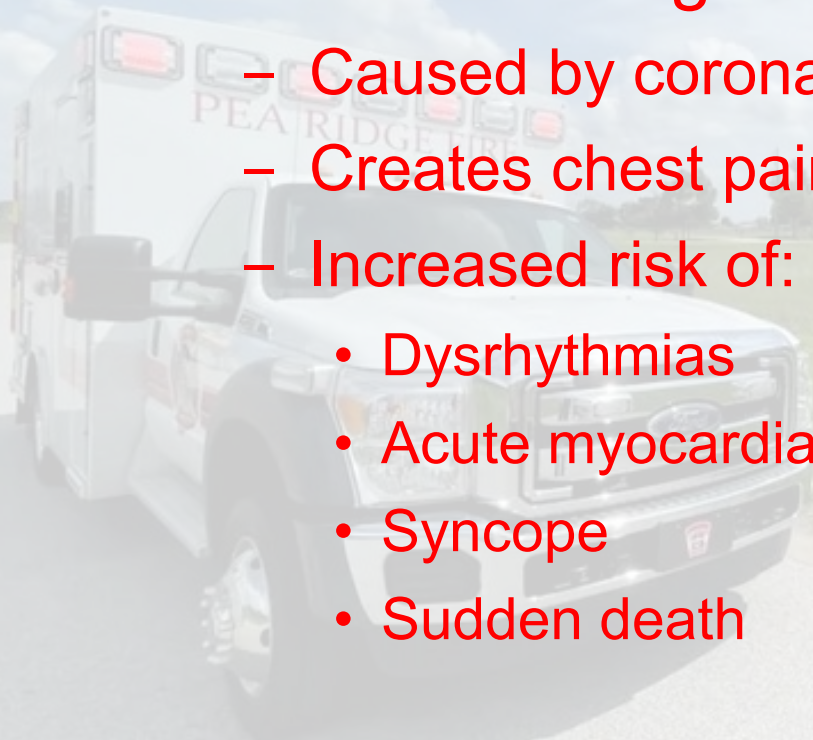
Angina Pectoris

- Stable angina
 - Follows a predictable, recurrent pattern
- Unstable angina
 - More serious, higher level of obstruction
 - Changes in frequency, severity, and duration
 - May begin during sleep or at rest
 - Warning of impending MI



Angina Pectoris

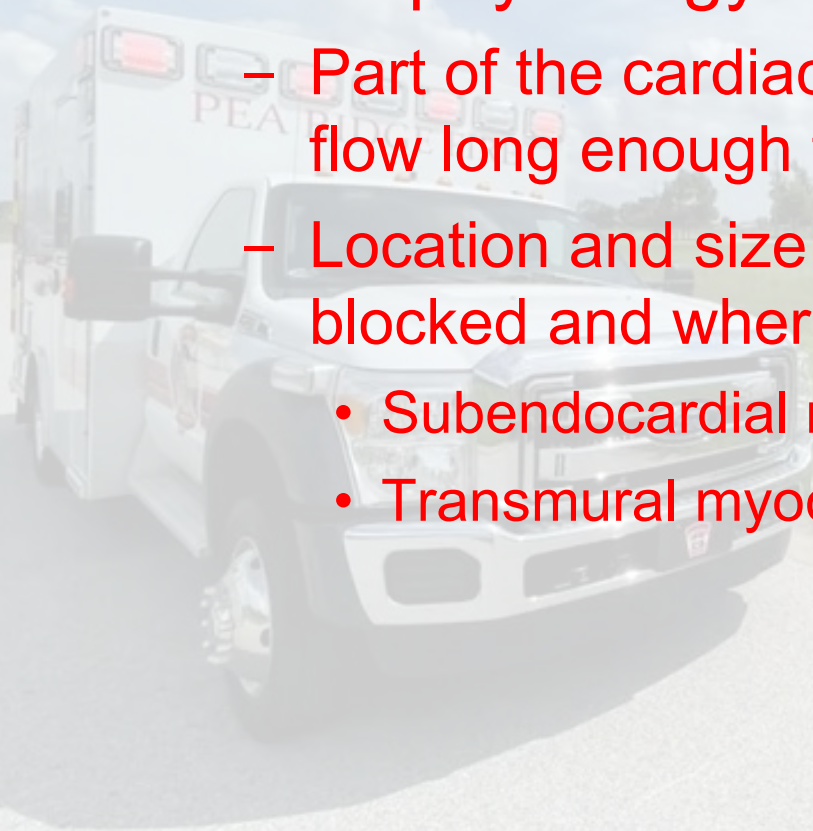
- Prinzmetal angina
 - Caused by coronary artery vasospasm
 - Creates chest pain at rest
 - Increased risk of:
 - Dysrhythmias
 - Acute myocardial infarction
 - Syncope
 - Sudden death



Acute Myocardial Infarction (AMI)

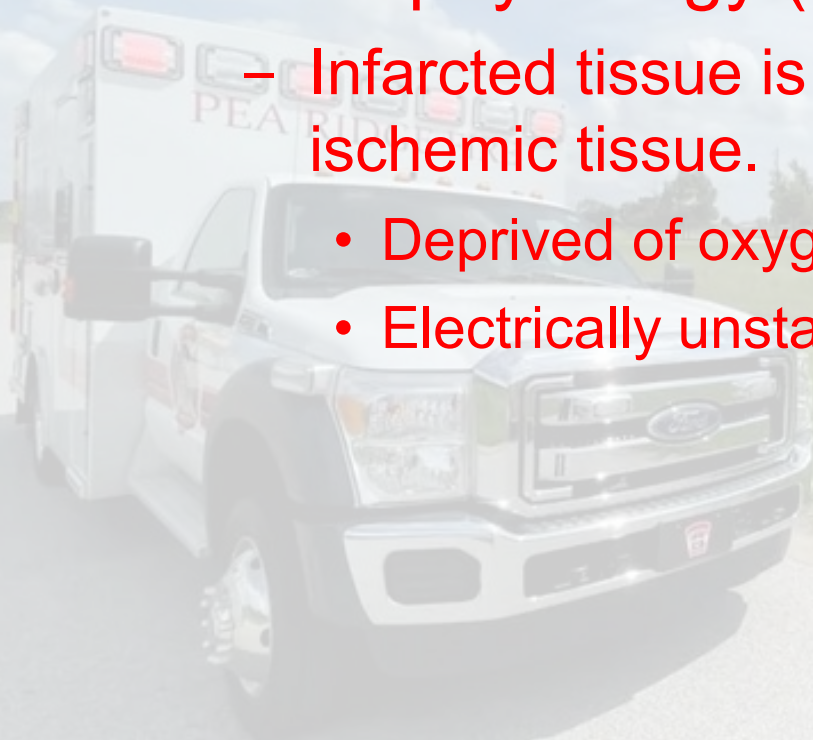
- Pathophysiology

- Part of the cardiac muscle is deprived of blood flow long enough that portions die.
- Location and size depends on which artery is blocked and where.
 - Subendocardial myocardial infarction
 - Transmural myocardial infarction



Acute Myocardial Infarction (AMI)

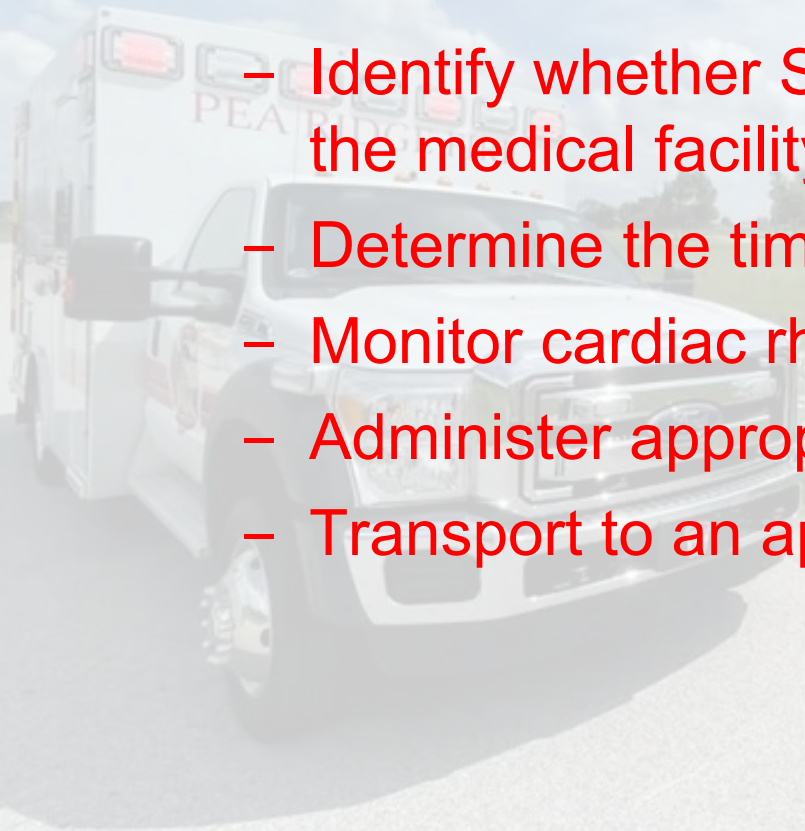
- Pathophysiology (cont'd)
 - Infarcted tissue is surrounded by a ring of ischemic tissue.
 - Deprived of oxygen but still viable
 - Electrically unstable



Acute Myocardial Infarction (AMI)

- Assessment

- Identify whether STEMI is present; if so, notify the medical facility.
- Determine the time of onset.
- Monitor cardiac rhythm and vital signs.
- Administer appropriate medications.
- Transport to an appropriate facility.

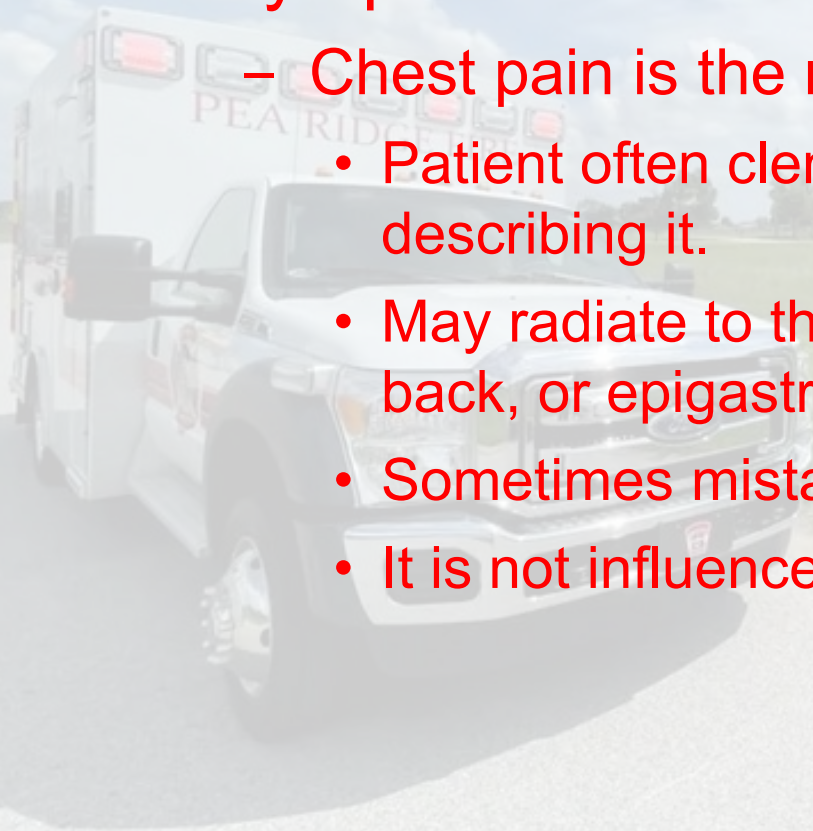


Acute Myocardial Infarction (AMI)

- Symptoms

- Chest pain is the most common symptom.

- Patient often clenches his or her fist when describing it.
 - May radiate to the arms, fingers, neck, jaw, upper back, or epigastrium.
 - Sometimes mistaken for indigestion.
 - It is not influenced by body movements.



Acute Myocardial Infarction (AMI)

- Symptoms (cont'd)
 - Not every ACS patient has chest discomfort (a silent MI).
 - Symptoms of MI other than chest pain are called anginal equivalents.

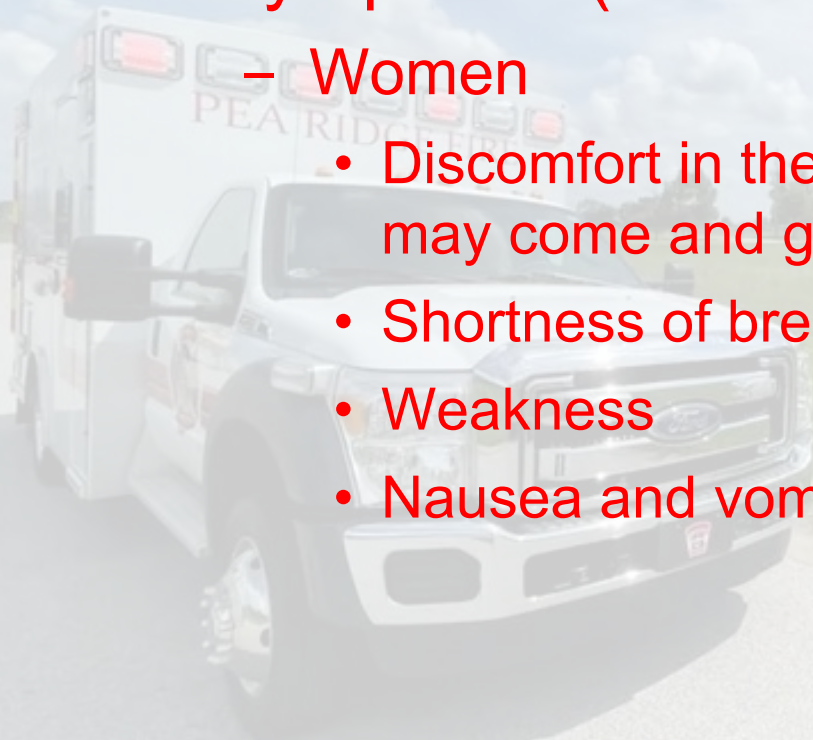
Table 17-11

Anginal Equivalents

- Abdominal pain
- Acute change in mental status
- Dizziness
- Dyspnea
- Dysrhythmia
- Epigastric pain
- Fatigue
- Generalized weakness
- Indigestion
- Isolated arm or jaw pain
- Light-headedness
- Palpitations
- Restlessness
- Syncope or near syncope
- Unexplained nausea or vomiting

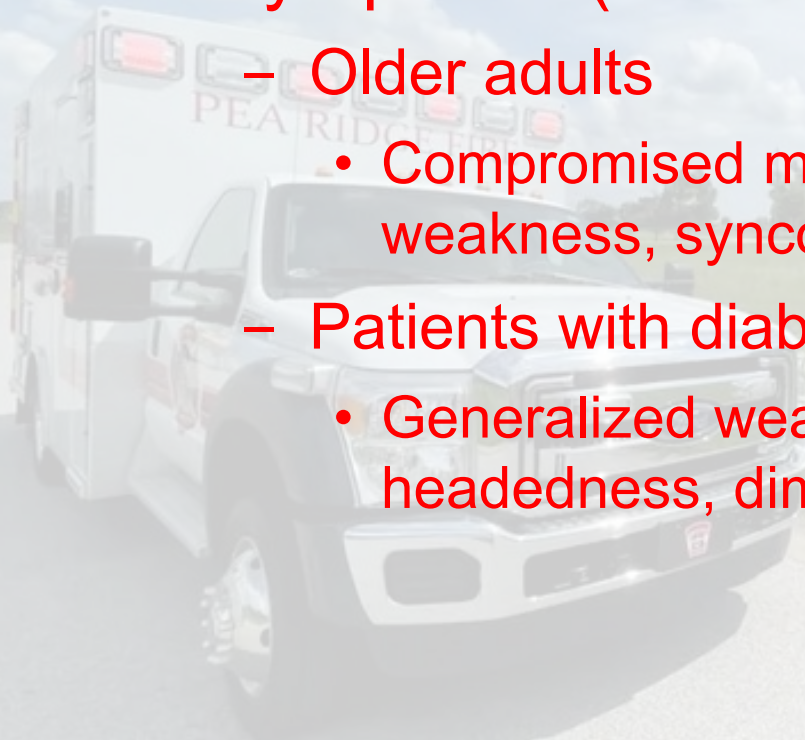
Acute Myocardial Infarction (AMI)

- Symptoms (cont'd)
 - Women
 - Discomfort in the back, shoulder, or neck that may come and go
 - Shortness of breath
 - Weakness
 - Nausea and vomiting



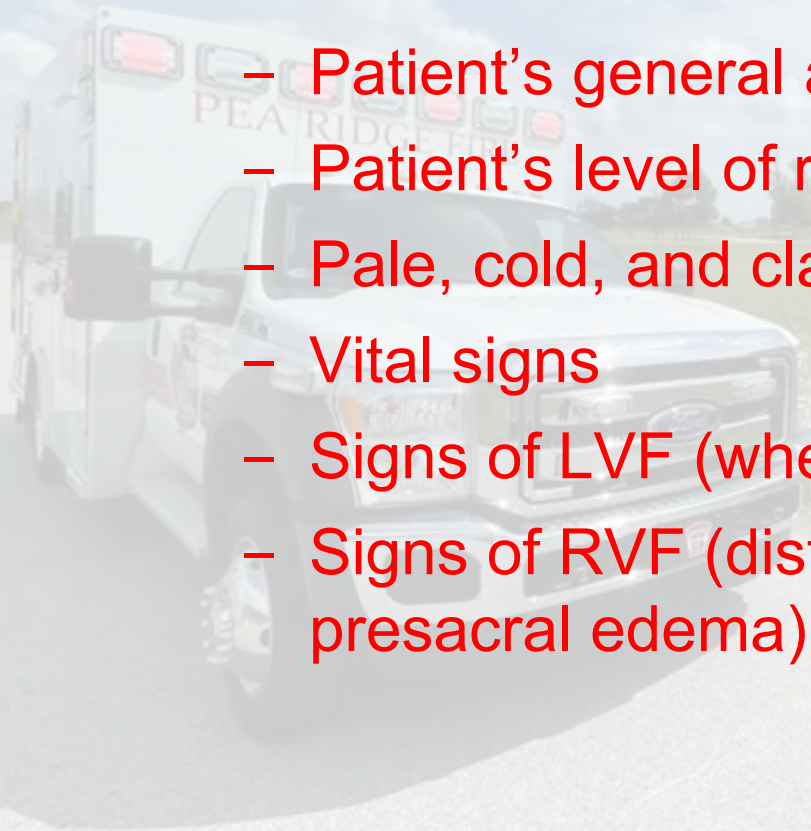
Acute Myocardial Infarction (AMI)

- Symptoms (cont'd)
 - Older adults
 - Compromised mental status, generalized weakness, syncope, shortness of breath
 - Patients with diabetes
 - Generalized weakness, syncope, light-headedness, diminished mental status



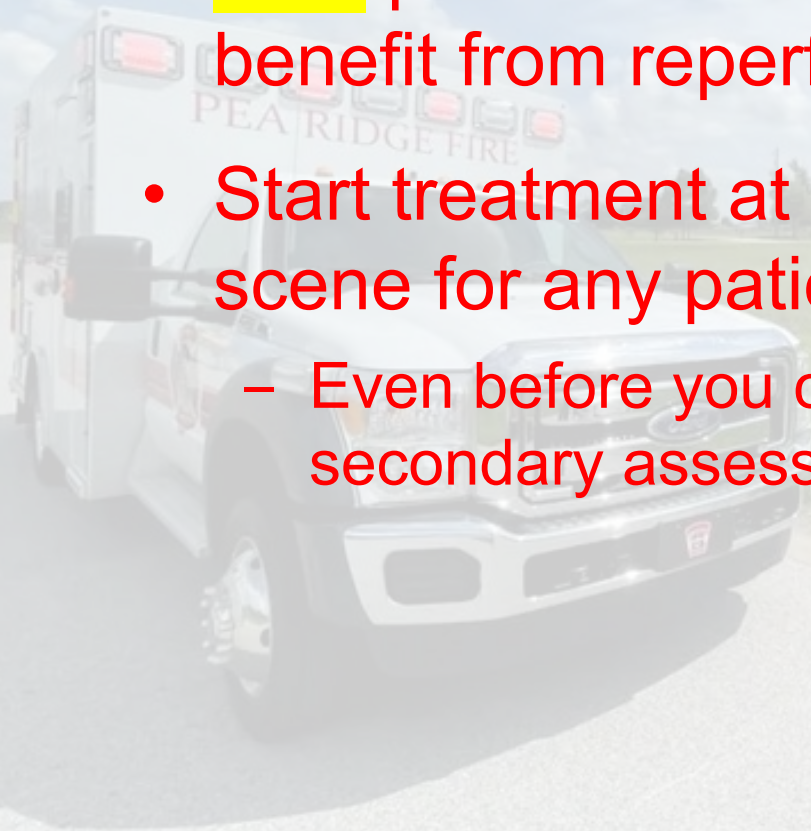
Acute Myocardial Infarction (AMI)

- Take note of:
 - Patient's general appearance
 - Patient's level of responsiveness
 - Pale, cold, and clammy skin
 - Vital signs
 - Signs of LVF (wheezes or crackles)
 - Signs of RVF (distended neck veins, pedal or presacral edema)



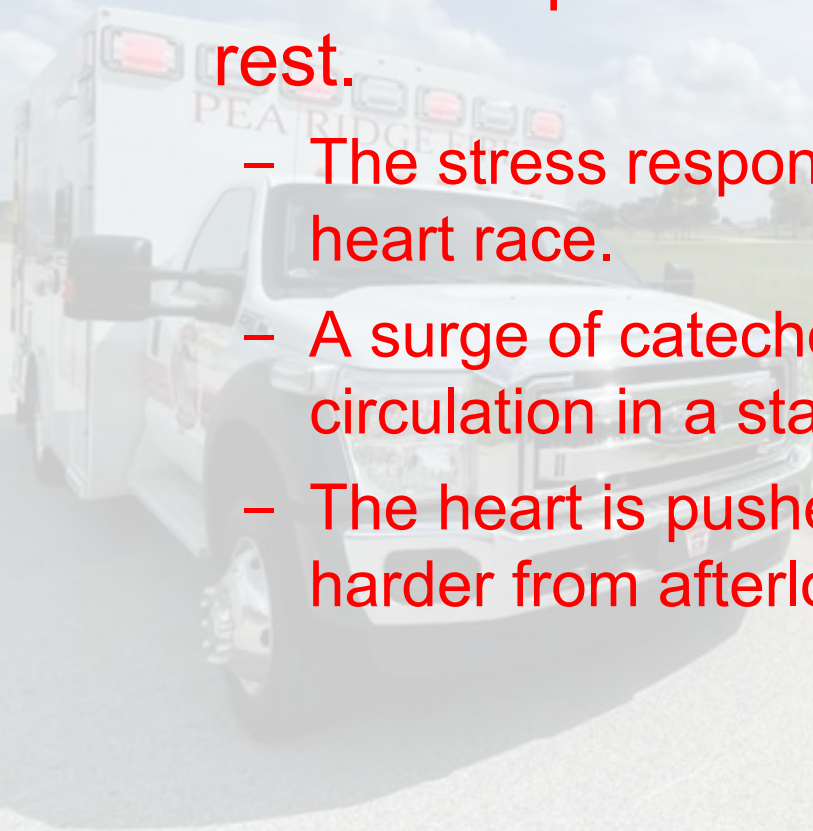
Management of Acute Coronary Syndromes

- ACS patients with STEMI are most likely to benefit from reperfusion therapy.
- Start treatment at once on arrival at the scene for any patient with chest discomfort.
 - Even before you complete the history or secondary assessment



Management of Acute Coronary Syndromes

- Place the patient at physical and emotional rest.
 - The stress response can make a damaged heart race.
 - A surge of catecholamines can place peripheral circulation in a state severe vasoconstriction.
 - The heart is pushed faster, but also works harder from afterload.



Management of Acute Coronary Syndromes

- To begin treatment, place the patient in a semi-Fowler position.
 - Do not allow the patient to get on the stretcher alone.
- Record vital signs.



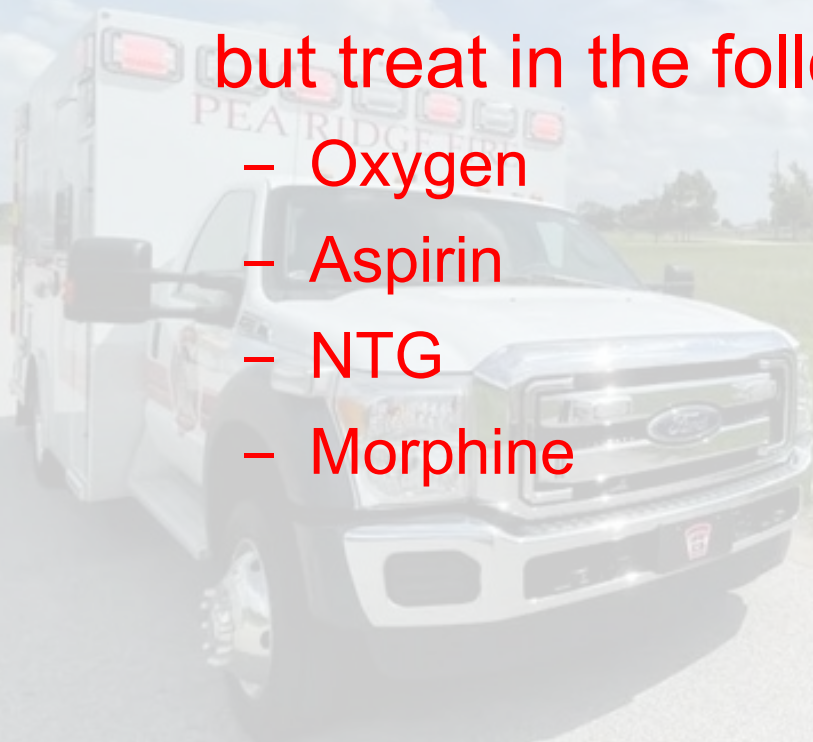
Management of Acute Coronary Syndromes

- Perform cardiac monitoring
 - Listen for rhythm irregularities.
 - Keep cardiac drugs close at hand.
 - Treat pulseless rhythms in accordance with the algorithm for each respective dysrhythmia.
 - Initiate CPR, defibrillation, or cardioversion, if indicated.



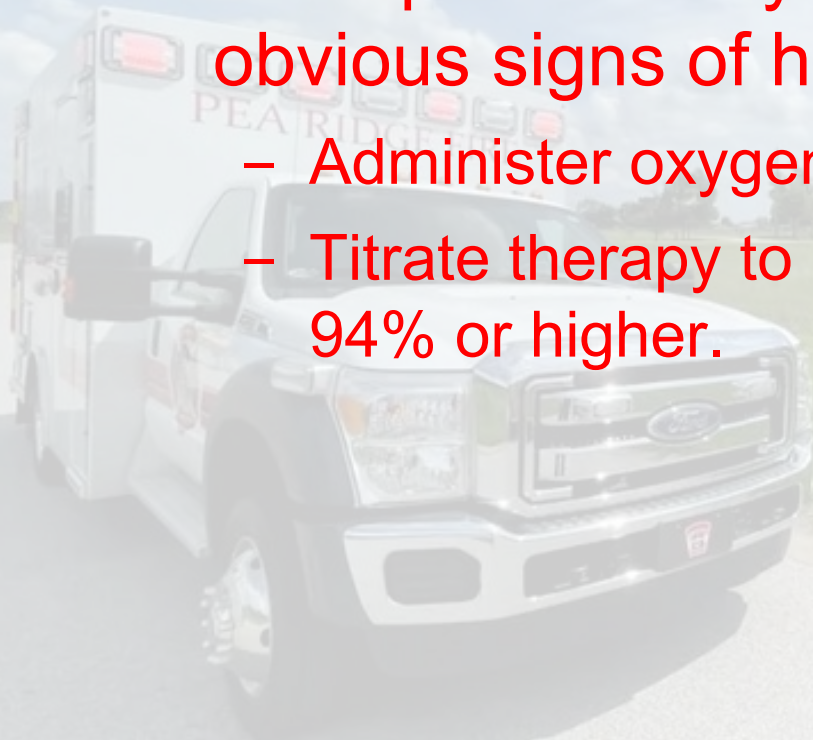
Management of Acute Coronary Syndromes

- Remember the MONA mnemonic device, but treat in the following order:
 - Oxygen
 - Aspirin
 - NTG
 - Morphine



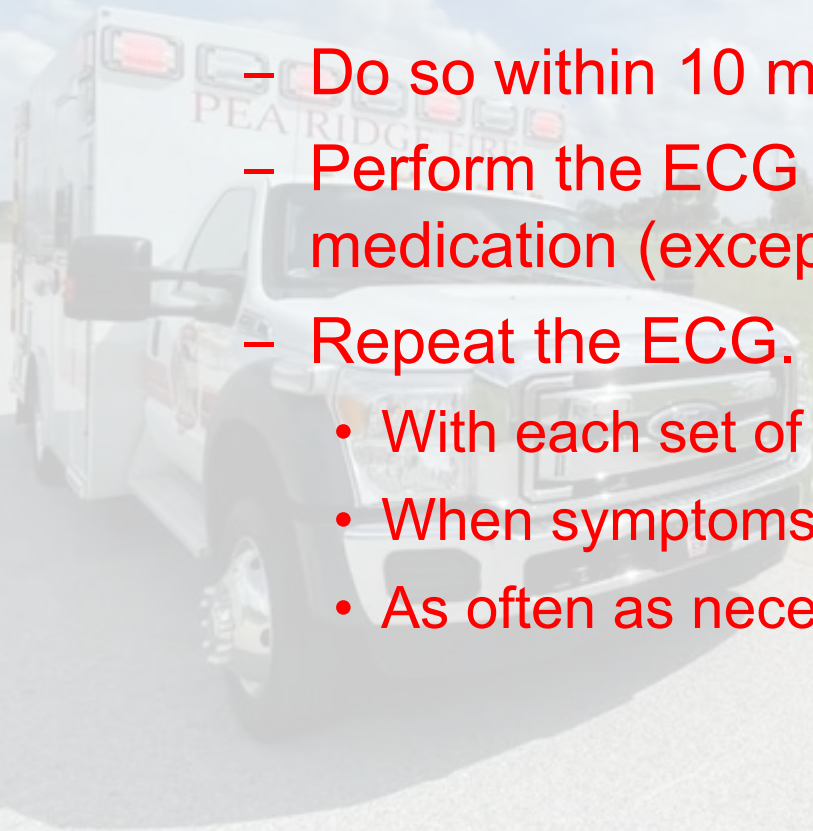
Management of Acute Coronary Syndromes

- If the patient is dyspneic, hypoxemic, or has obvious signs of heart failure:
 - Administer oxygen.
 - Titrate therapy to maintain the SpO₂ level at 94% or higher.



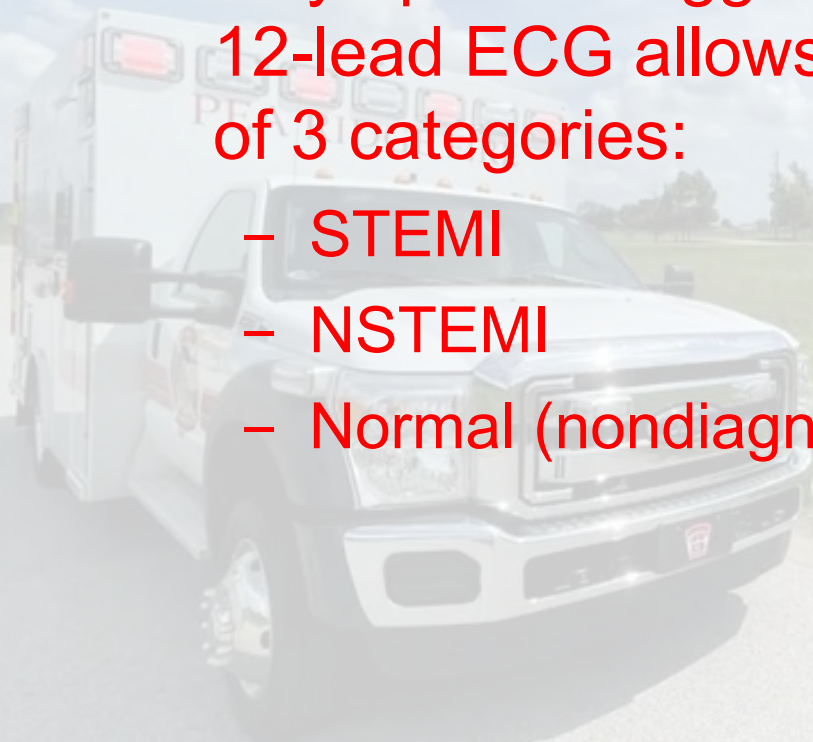
Management of Acute Coronary Syndromes

- Obtain a 12-lead ECG.
 - Do so within 10 minutes of patient contact.
 - Perform the ECG before administration of any medication (except aspirin and oxygen).
 - Repeat the ECG.
 - With each set of vital signs
 - When symptoms change
 - As often as necessary

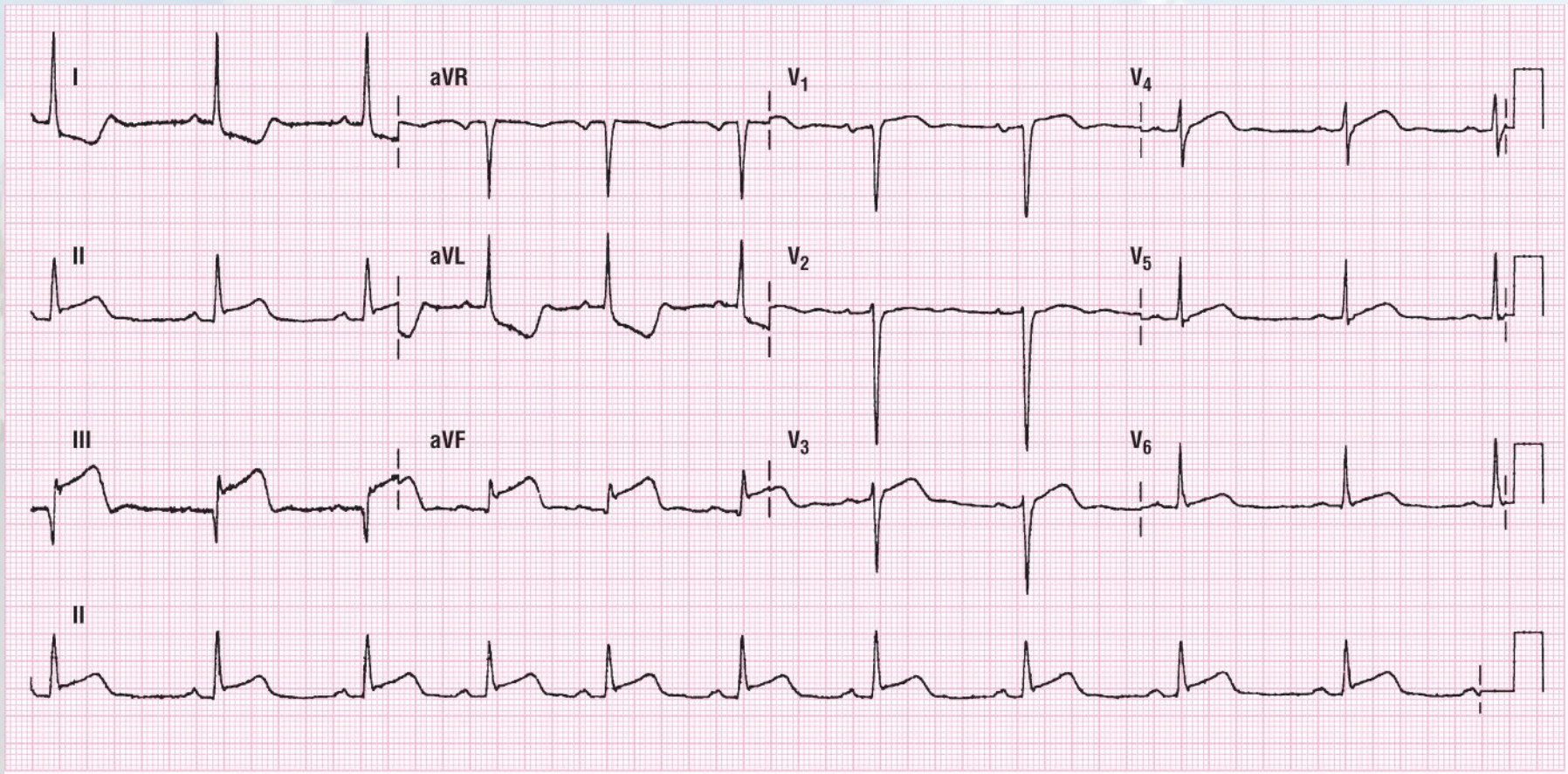


Management of Acute Coronary Syndromes

- If symptoms suggest ischemia or infarction, the 12-lead ECG allows for rapid placement into 1 of 3 categories:
 - STEMI
 - NSTEMI
 - Normal (nondiagnostic)



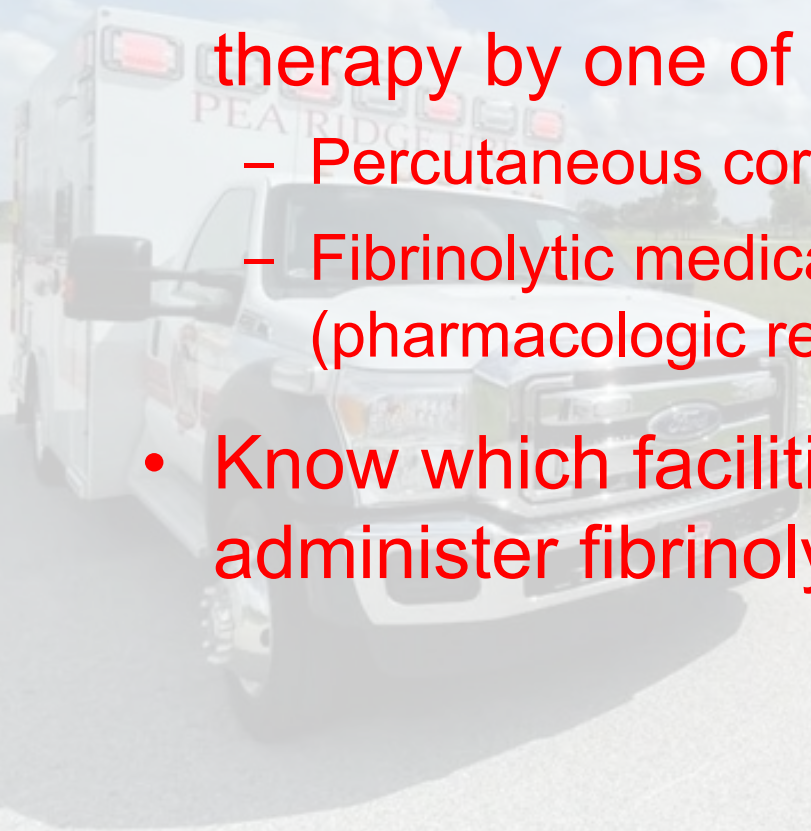
Management of Acute Coronary Syndromes



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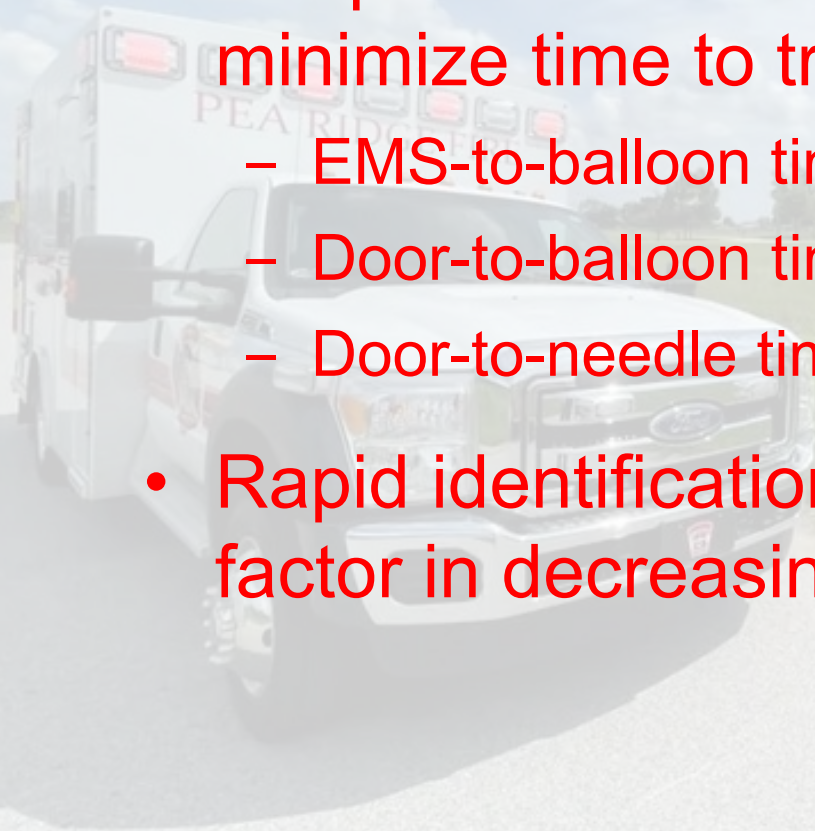
Management of Acute Coronary Syndromes

- STEMI treatment requires reperfusion therapy by one of the following:
 - Percutaneous coronary intervention (PCI)
 - Fibrinolytic medication to dissolve blood clots (pharmacologic reperfusion)
- Know which facilities are equipped to administer fibrinolytic therapy and/or PCI.



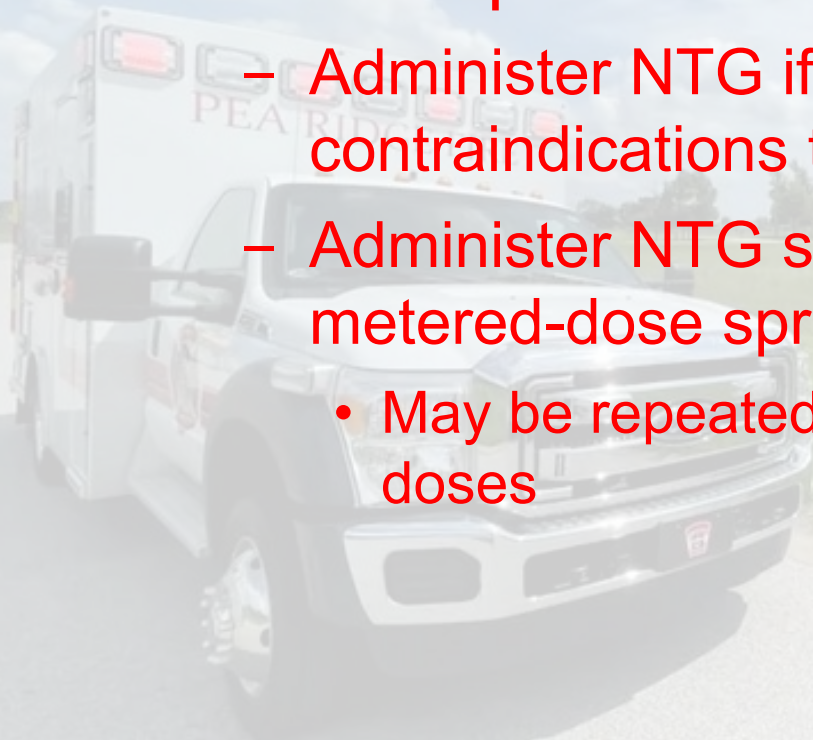
Management of Acute Coronary Syndromes

- For patients with STEMI, it is critical to minimize time to treatment:
 - EMS-to-balloon time
 - Door-to-balloon time
 - Door-to-needle time
- Rapid identification is the most important factor in decreasing EMS-to-balloon time.



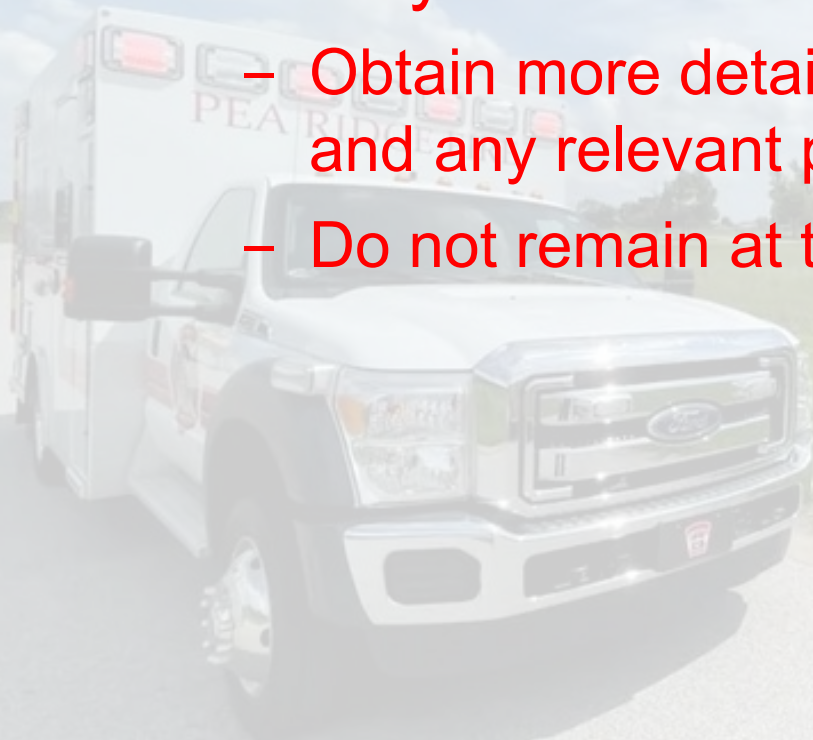
Management of Acute Coronary Syndromes

- Provide pain relief
 - Administer NTG if you are sure there are no contraindications to its use.
 - Administer NTG sublingually as a 0.4-mg tablet or metered-dose spray.
 - May be repeated every 3 to 5 minutes for up to three doses



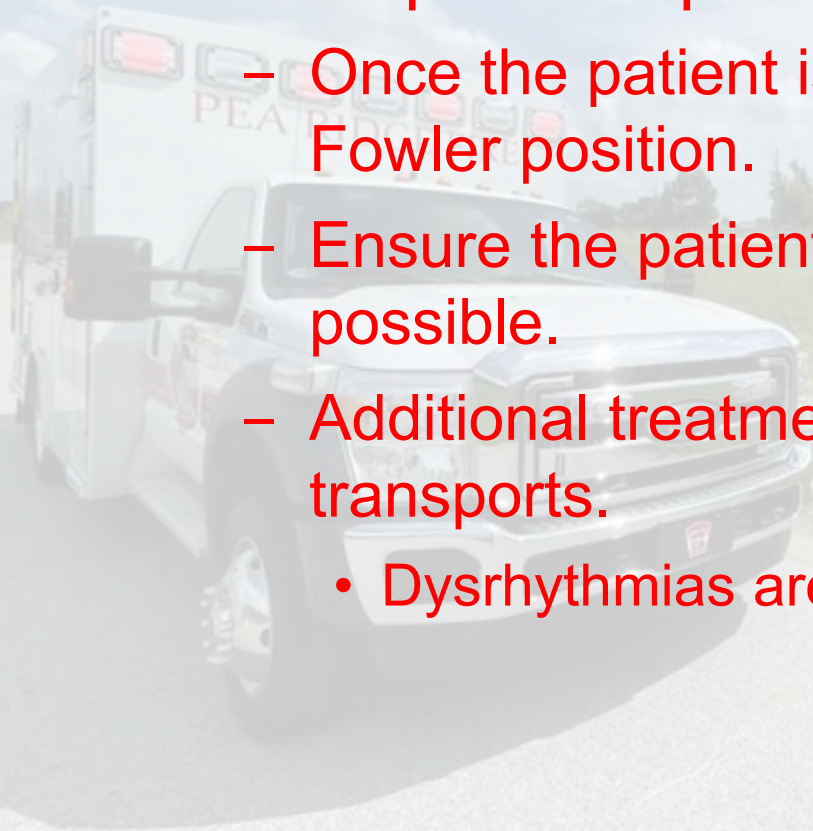
Management of Acute Coronary Syndromes

- History and secondary assessment
 - Obtain more details about current symptoms and any relevant past medical history.
 - Do not remain at the scene.



Management of Acute Coronary Syndromes

- Transport the patient.
 - Once the patient is stable, transport in semi-Fowler position.
 - Ensure the patient is as comfortable as possible.
 - Additional treatment is advisable for long transports.
 - Dysrhythmias are common after infarction.



Management of Acute Coronary Syndromes

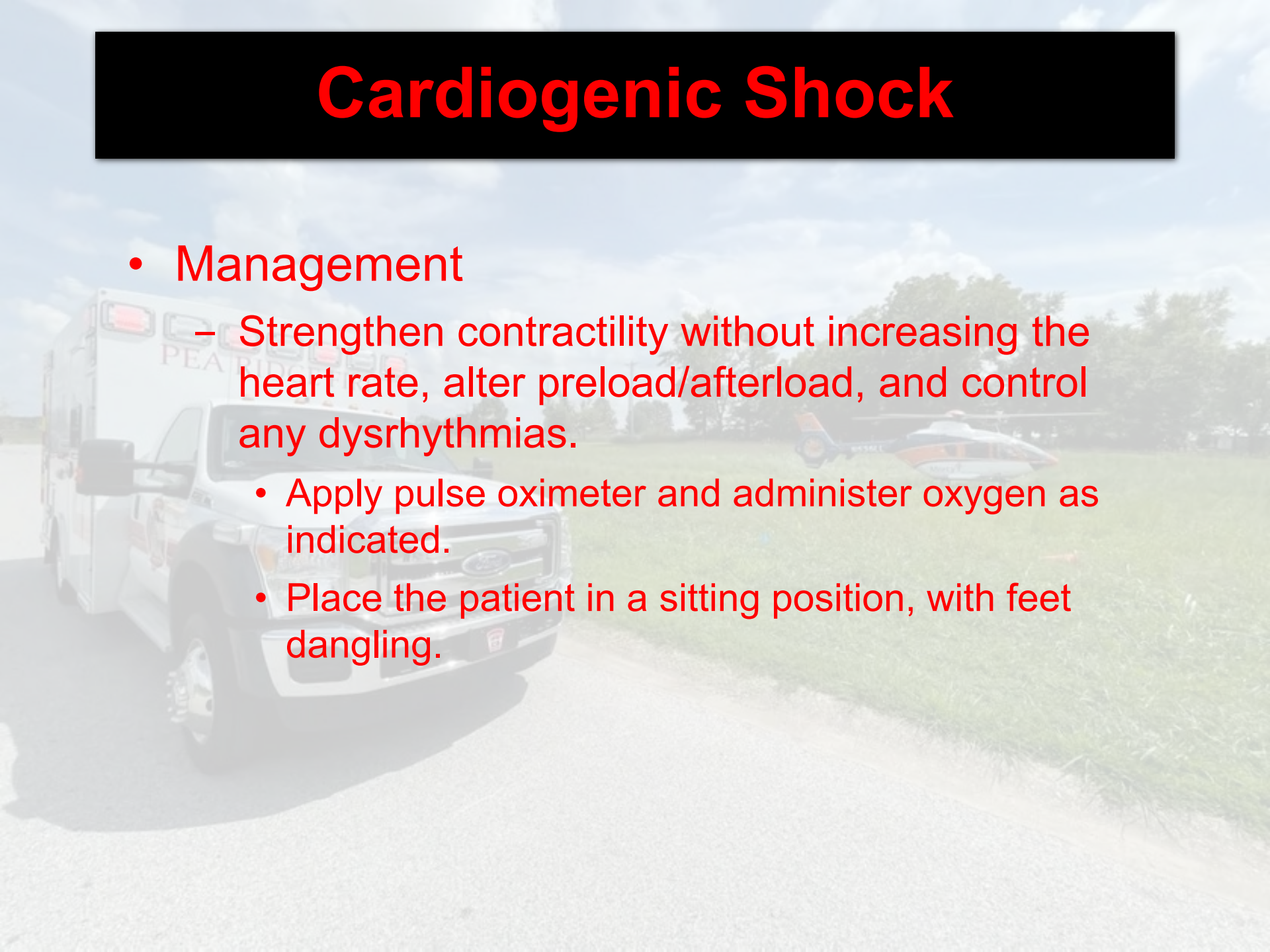
- A person with chest discomfort who refuses care is a high-risk refusal patient.
 - Calmly try to persuade the patient.
 - If you suspect an MI, tell him or her.
 - Use nonmedical language
 - Explain the risks of not accepting care
 - Contact medical direction if necessary
 - Document refusal

Cardiogenic Shock

- Management

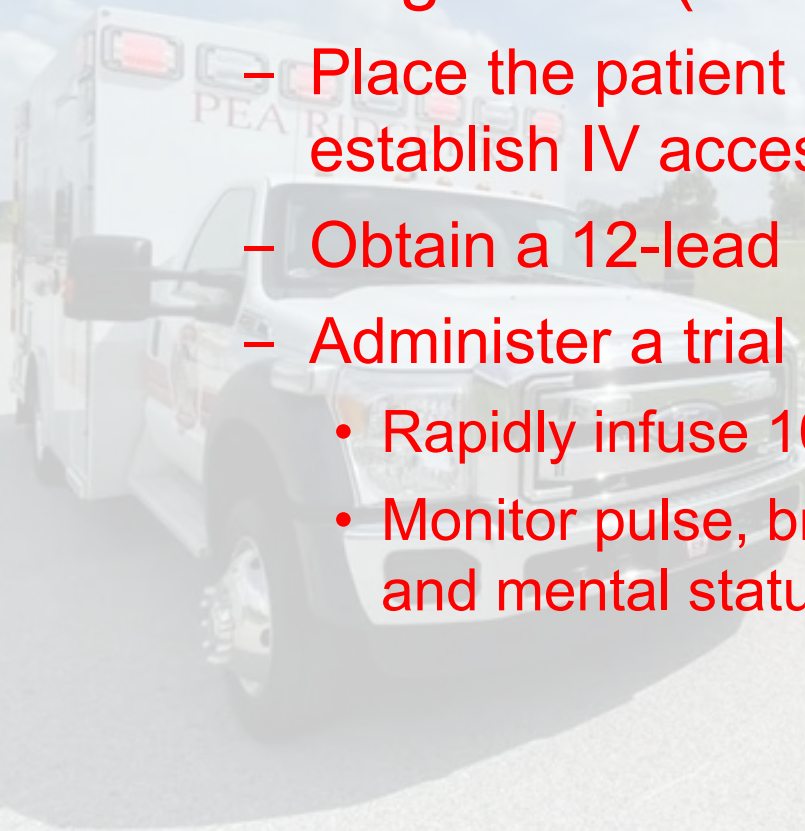
- Strengthen contractility without increasing the heart rate, alter preload/afterload, and control any dysrhythmias.

- Apply pulse oximeter and administer oxygen as indicated.
 - Place the patient in a sitting position, with feet dangling.



Cardiogenic Shock

- Management (cont'd)
 - Place the patient on a cardiac monitor and establish IV access.
 - Obtain a 12-lead ECG.
 - Administer a trial of fluids.
 - Rapidly infuse 100 to 200 mL of saline.
 - Monitor pulse, breath sounds, blood pressure, and mental status.



Thank You !



Please move to the next section